THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVI. No. 1693.] LONDON, OCTOBER 22, 1895. [47TH YEAR. PRICE 6d.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

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PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

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PRICES, &C., ON APPLICATION.

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LANEMARK CANNEL AND GAS COALS.
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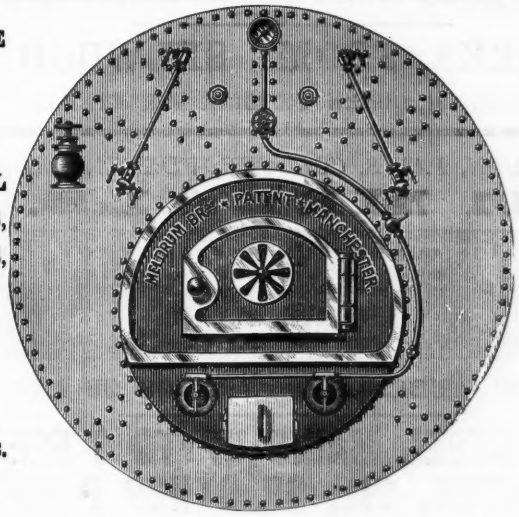

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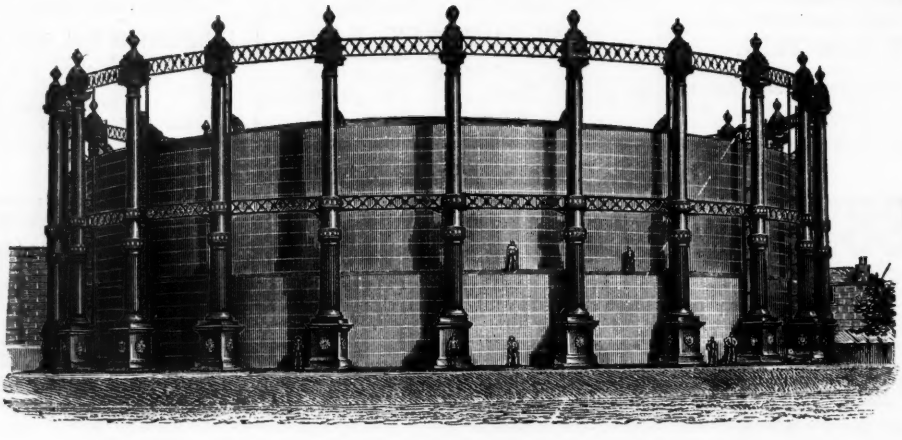

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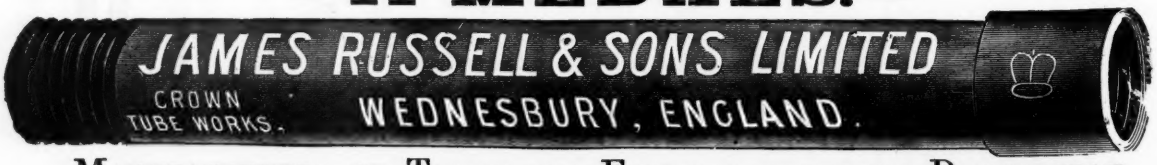

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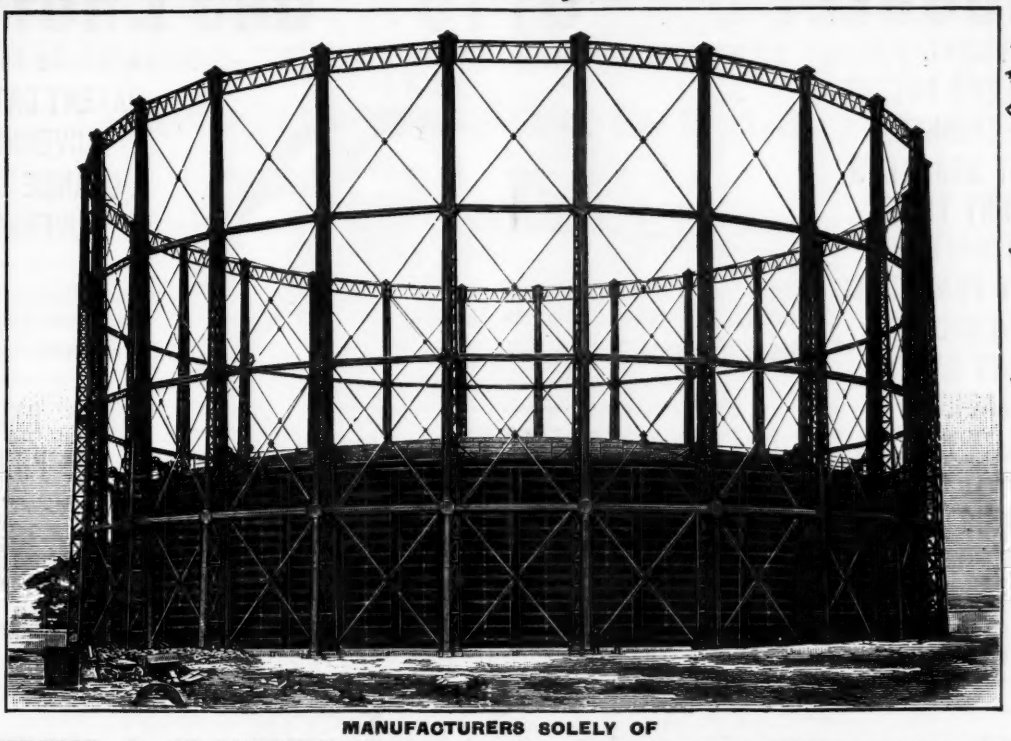

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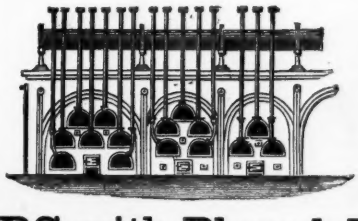

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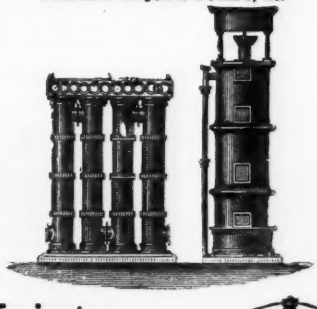

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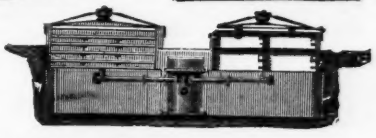

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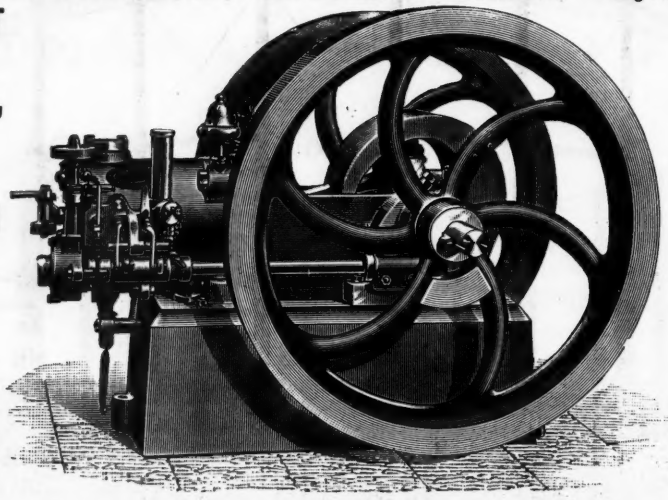

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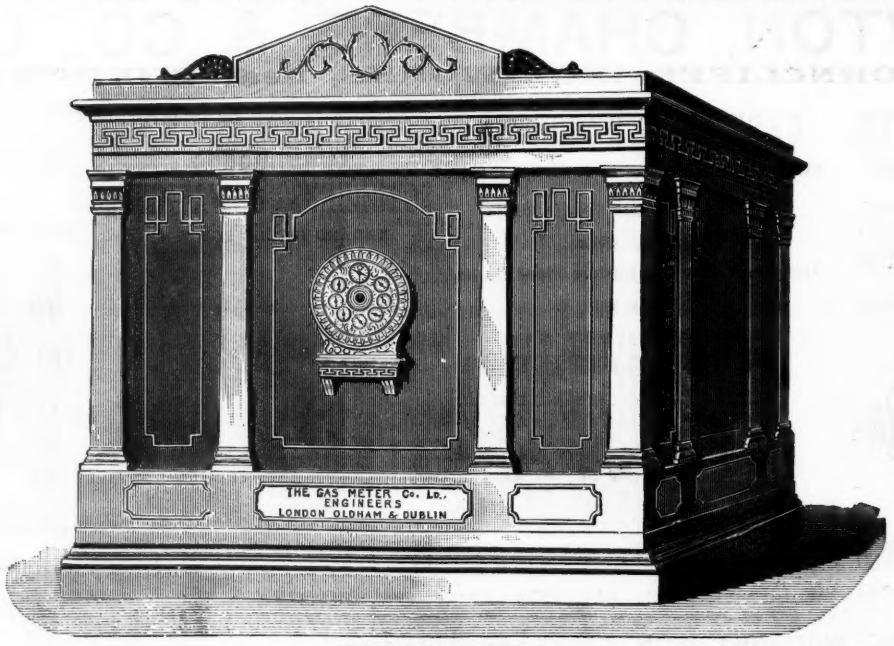

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[See Advertisement on back of Wrapper.

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EFFICIENT.

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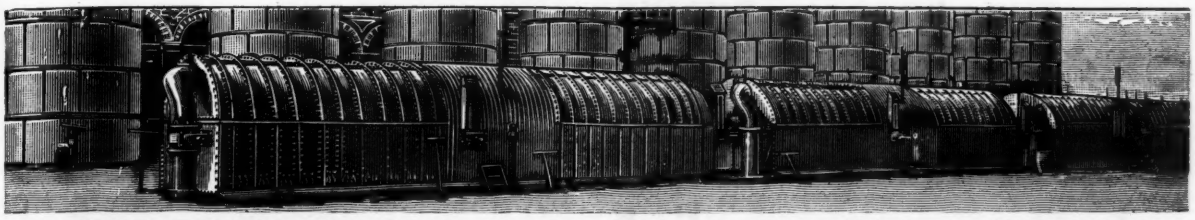
PATENT "STANDARD" WASHER-SCRUBBER

☛ **502** of these Machines (capable of dealing with **488,800,000** cubic feet of Gas daily) in use and in course of construction, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company have 30 of these Machines in use. They are also in operation at a great number of Gas and other Works in this Country and Abroad.

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SIMPLE DIRECT-FIRED FURNACES,
THROUGH & SINGLE BEDS,

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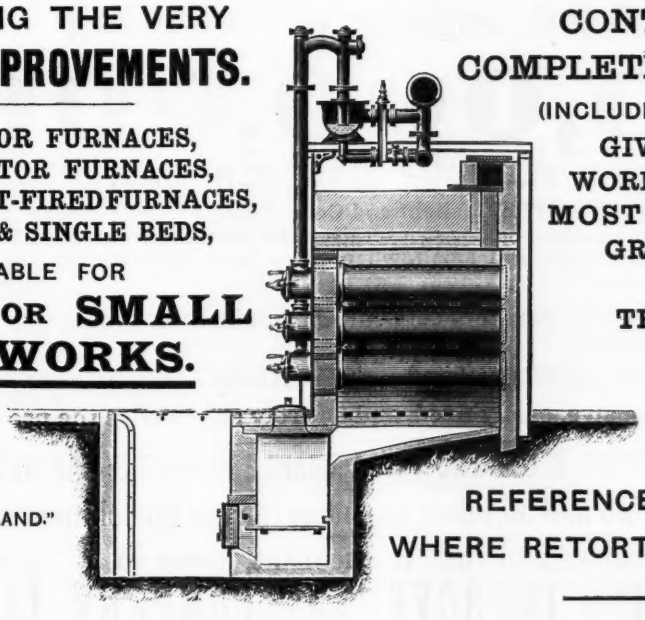

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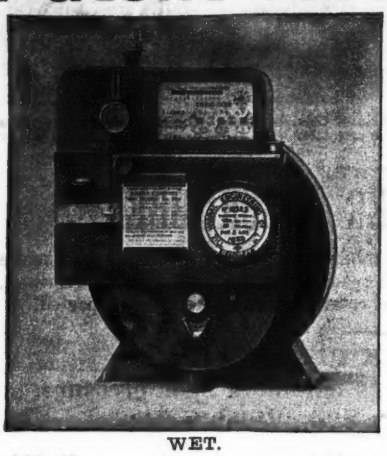

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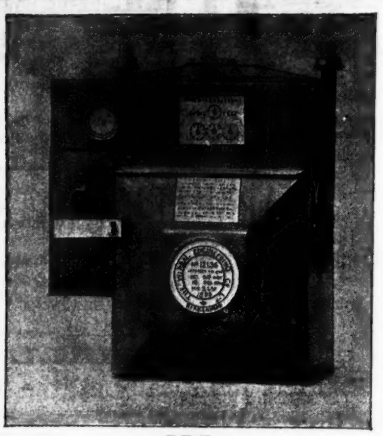
Simple! Positive!! Accurate!!!

The only Prepayment Meter with no Springs, Counter-Balance Weights, or Frictional Gearing to get out of order.



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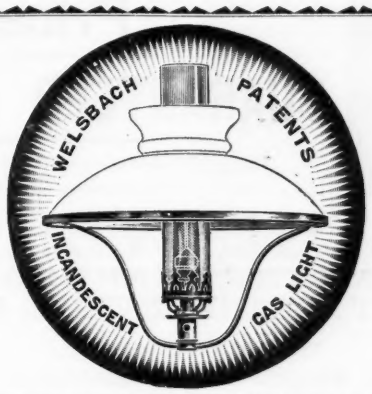
Places this highly popular Light within the means of all classes.

The greatly Reduced Consumption of Gas COVERS THE INITIAL COST OF THE BURNERS IN FROM SIX TO EIGHT MONTHS.



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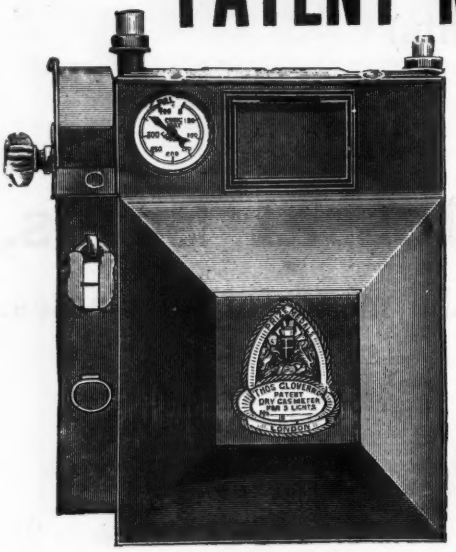

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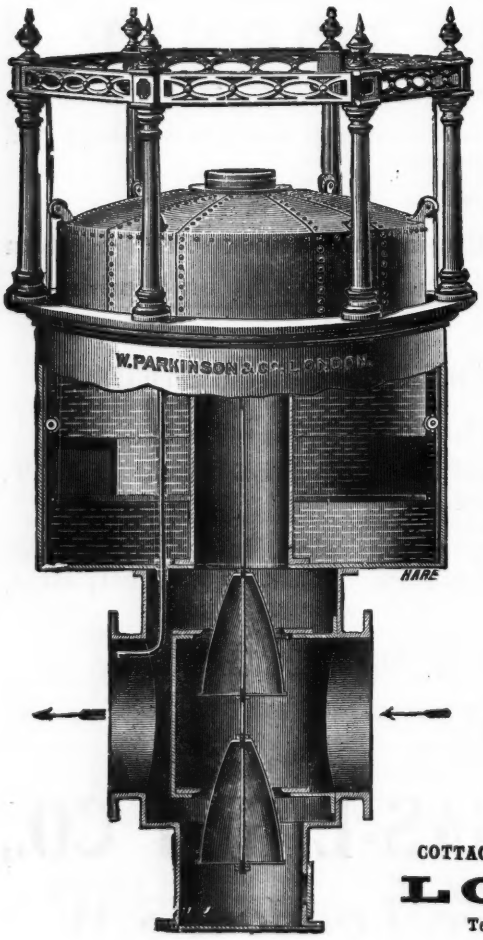

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A very large number are now at work; and all Engineers who have adopted them speak in unqualified terms of their great efficiency.

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TWO, FOUR, or SIX COLUMNS and GIRDERS.
WEIGHTS or WATER PRESSURE.

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[See also Advt. p. 852.

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TO CORRESPONDENTS.

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EDITORIAL NOTES.

Why Should Municipal Gas Capital be Redeemed?

THERE is one aspect of the question recently raised in these columns respecting the redemption of gas capital, which—although touched upon in the last paragraph of Mr. George Livesey's letter of a fortnight ago only to be dismissed as not susceptible of useful discussion—may be very briefly considered as a sort of side-issue. It is the question why local authorities should be required to pay off their gas loans, any more than gas companies are permitted or enjoined to redeem their capital. Mr. Livesey thinks it useless to discuss such a question; and possibly he is right. But if he is also in the right in holding it to be "just that the consumers of any article should pay such "a price as will cover not only the cost of manufacture, "but also the equally fair charges for interest on the "capital required to carry on the business"—then the actual practice of municipal gas undertakings in this regard is unjust, and ought to be altered as soon as may be. Observe, it is not now a question of wiping off the extra capital indebtedness of a corporation undertaking attributable to the charges for goodwill, compulsory purchase, or any intangible but very real property of this kind. Municipalities have to pay for gas undertakings founded and developed by private enterprise, and safeguarded by statute, double the price at which the same material equipment could be started anew.

If the process of redemption were restricted to that proportion of the capital of a municipalized gas undertaking which is not represented by actual value in the shape of assets and money, there would not be so much difference between the condition as to capital of such a concern and that of one not so circumstanced. Seeing, however, that the process is not so limited, but that on the contrary everything has to be repaid within one or at most two generations, the time must come when consumers of municipal gas will be relieved from paying any capital charges whatsoever, except those for making extensions and for working with. It is not every such gas consumer who will reap the full benefit of this condition of affairs; for many will be required to subsidize the ratepayer the more heavily. But in places like Glasgow, the disappearance of cost of capital will put the consumer in a very different position from that occupied by the customer of a gas company of the same period. The question is, why the consumer of municipal gas should have this advantage, for which his predecessors will have paid. Is there not something inconsistent with the position of other property of the same kind, in the idea of a town possessing a gas-works worth any day a million of money—the amount, of course, is really immaterial—yet standing for nothing in the town books?

The inquiry is suggested as to whether this kind of eventuality was ever contemplated when local authorities were first permitted to trade with public money. How was it that the Local Government Board, who are supposed to look after these things, did not at least draw the attention of Parliament to the essential difference that exists between the application of public money to sanitary or administrative purposes and its utilization in trade? It is obviously desirable that money borrowed (say) for paving or sewering a town should be redeemed within a reasonable time. Money spent upon the improvement of a town is not always represented even by a definite increase in the rateable value; and it can, of course, never be recovered. A gas undertaking stands in a totally different category. It is always worth its value. The Manchester Corporation may never see back, in any form, the money they have poured into the Ship Canal; but if they were in danger of getting into serious financial difficulties over this venture, and needed to realize their property, a purchaser for the local gas undertaking could be found in a few hours. Why, then, tax the present consumer for reducing its capital below the actual, realizable value? The question may evoke no useful answer, but it is certainly pertinent to the whole problem of gas finance.

Liverpool Gas Affairs.

THE gas affairs of Liverpool continue to attract a considerable amount of attention, and furnish the local newspapers with something to interest their readers about, in connection with municipal politics. The name of Mr. George Livesey was mentioned in a Liverpool newspaper

as being that of the "eminent gas engineer in London" who would be retained by the Town Clerk to report upon the gas supply in accordance with the resolution of the City Council to set up competitive gas-works; but, as will be seen from a letter which appears in another column, this was a mere *canard*. It has afforded Mr. Livesey the opportunity, of which he has not been slow to avail himself, for giving the Corporation a bit of good advice as to how they ought to treat the gas question, which they have themselves raised. The Corporation have, of course, sadly muddled the business they took in hand, and now the Directors of the Gas Company decline to have any more interviews with the Corporation Lighting Committee, in face of the hostile action of the Corporation in passing their ridiculous resolution at the instigation of perhaps the least qualified of all the city councillors to guide them to a right decision in such a matter. Alderman F. Smith has not taken our advice to study the working of competitive gas supplies in the United States. But he thinks he knows something about how they manage these things in France; and, in a letter to the newspapers, he actually holds up the system in force in Paris as a model for Liverpool to admire! Does he know what is the quality of Paris gas, what it costs the consumer, what dividends the shareholders receive, and what is the nature of the perpetual *question du gaz?* To judge from the public discussions of the Liverpool Gas Company's doings, nobody in the city would be supposed to know anything about the existence of auction clauses in connection with the gas undertaking. The Corporation have appealed to Cæsar, as represented by the High Court of Parliament, for permission to expend public money in the laudable enterprise of ruining the "monopolists" who oppress the city to the extent of paying about 4 per cent. interest upon the capital sunk in the gas undertaking. If they have the courage of their opinions, to Cæsar they will go—and a pretty figure they will cut at Westminster, if they ever get so far. It would be an inestimable privilege to get the present men of light and leading in the Corporation before a Parliamentary Committee, and hear Counsel at the congenial task of obtaining from them a display of the special knowledge and general wisdom that elevated them to their pre-eminent position as experts in gas supply matters.

Meanwhile, there can be no question as to why there is in Liverpool that modicum of popular discontent with the gas supply which supports the agitation in the City Council. It is all a matter of the price; and this again is all a matter of the illuminating power. If the Corporation had the works to-morrow, they would not make gas of the same quality as the Company are compelled to send out. There is no gas in England like it. This is what makes the present agitation so unfair to the Company. Not being able to say that the gas sold in Liverpool is not all that it should be, the enemies of the Company have tried to make out that it is no more costly to produce than that supplied in other towns, which is absurd. If the new City Council should happen to contain a few more sensible men than the present egregious collection, and these should take up the gas question with the idea of doing some good to the city in the matter, without despoiling the Company, they will act upon Mr. Livesey's sound advice, and take counsel with the Directors as to effecting a reduction in the standard of illuminating power. The Town Clerk has been instructed to initiate parliamentary proceedings in this connection; and the notices that must be drafted can be made to cover anything and everything it will be found advisable to do. Mr. Livesey cannot help the Corporation to attack the Gas Company; but he would probably consent gladly to help both Corporation and Company to settle what is the most economical standard of illuminating power that could be adopted for the gas supply of the future. In this direction, and no other, is cheap gas to be sought. Only those who are wilfully blind can fail to see this way out of the trouble of Liverpool, which arises simply from the fact that the fetish of the photometer receives sacrificial offerings to the tune of at least £80,000 a year.

The Need for Neat and Clean Street Lamp-Posts.

FAVOURABLE mention was made in a recent issue of the *Daily Graphic*, of some new street-lamp standards that have been fixed by the Vestry of St. Martin's-in-the-Fields in front of the new buildings of the National Portrait Gallery, which stand at the back of the National Gallery. It is somewhat surprising that the writer who does the art criticism for our brilliant daily contemporary should have taken the trouble to notice such a comparatively small contribution to the embellishment of the London streets; for it is probable that hardly one of a hundred passers-by would observe anything particularly striking about these unobtrusive lamp-posts. But we nevertheless hail the circumstance as gratifying, and at the same time encouraging. As we have often urged in these columns, there is a very great deal of lost ground to be recovered in this direction before London can challenge comparison of its public lighting arrangements with Paris, which is the cynosure of everything that can be designated municipal civility. The street lamp-posts of Paris, it must be admitted, err on the side of ostentatious adornment; but it cannot be denied that ours are, as a rule, very much the other way. The new St. Martin's pattern is a very neat specimen of iron casting, tastefully painted olive green, lined and picked out with dull red. The ladder-rest projects equally on two sides; and the only special attempt at adornment, under the suggestion of the *genius loci*, is a medallion on the base portraying St. Martin dividing his cloak with the beggar. Nothing could be neater or nattier, with due observance of the proprieties that circumscribe the opportunities of the designer of a street lamp-post intended for use rather than as a monument, than these standards. Few people, unless their attention had been specially drawn to them, would bestow a second glance upon them as they stand in front of a public building intended to fill the observer's eye; but when noticed they would not be a disappointment, much less an eyesore. It is for leaders and formers of public opinion, on the platform and in the press, to instruct local authorities in all these points, great and small, upon which the character of the aspect of our streets depends.

There exist in the St. Martin's and in other districts, town and provincial, hundreds and even thousands of lamp-posts put up half-a-century and more ago, which, rude enough originally, have been smothered since under so many coats of paint, that they are now about as defined in outline as a sausage, and incline so far out of the perpendicular as to appear to implore that rest from their prolonged vigil which considerations of false economy still deny. It is greatly to be wished that the authorities who are responsible for giving and maintaining an air of smartness in the streets, would look more keenly into this matter of the lamp-posts, and remove the old stagers which, although aged, are not in the smallest degree venerable or picturesque in their decrepitude. And when they do set up new and acceptable lamp-posts, it could be desired that they should show more solicitude about keeping them clean. A dingy or smeary lantern is a great reproach to whoever may be responsible for its condition; and cracked and broken glass is the abomination of desolation. But, in England, lamp-posts, railings, guard-posts, and all the miscellaneous appurtenances of a modern thoroughfare, usually exhibit an innocence of soap and water that is anything but creditable to us as a cleanly people. We claim as a national trait the habit of washing ourselves oftener and more thoroughly than our Continental neighbours. Our consumption of detergents is enormous, and its statistics would probably show that the claim of the people to be cleanly in their persons and habits is just. But it is only too obvious that, in the matter of maintaining the appearance of those streets and other public structures and fittings which are everybody's business to use and defile, these same neighbours leave us far behind. We make the best roads and pavements in the world, and do not half clean them. We erect the most attractive-looking business buildings, and leave them to be splashed and stained out of half their beauty. Our railway stations, post-offices, churches, public offices, places of entertainment, are lost in filth where the daily sweeper does not perform his perfunctory duty; and so it is small wonder that the street lamp-post is similarly neglected. The last-named is a small thing to clean; but if a beginning were made with it, who knows what the force of example might effect?

The Law of Local Authorities and Gas Shareholders.

A SPECIAL meeting of the Reigate Town Council has been recently held for the purpose of considering various local questions in regard to electric lighting; and in the course of the proceedings—shortly reported in another column—objection was taken to an Alderman, who is a Director

of the Gas Company, voting in connection with the matter. This point has often been raised on similar occasions, with the usual result of the gas shareholders declining to take part in discussions of, or voting upon, such questions. Reference was made at Reigate, however, to an opinion of Mr. G. Humphreys, Barrister-at-Law, recorded in the JOURNAL for April 10, 1894, which was to the effect that in the case of certain members of the Monmouth Town Council who were also shareholders and Directors of the Monmouth Gas and Water Company, there was nothing in the Municipal Corporations Act, 1882, to prevent their taking part in the discussion of, or voting upon, any resolution dealing with the electric lighting scheme. The Act declares that no members of a local authority, having pecuniary interest, direct or indirect, by themselves or their partners, in a question to be decided by such local authority, shall vote upon it. The principle of the enactment is clear enough; and the only question that arises concerning it is as to whether the fact of being a gas shareholder does give a member of a local authority a pecuniary interest in the settlement of an electric light project by that authority. Mr. Humphreys opines that it does not; but when the Town Clerk of Reigate (Dr. Clare J. Grece) was about to overrule the point raised the other day in this sense, a contradictory opinion by Mr. R. S. (now Mr. Justice) Wright, as well as one by Sir R. E. Webster, was brought to his notice; and he therefore refused to put his own ruling in opposition to such authorities. In the end, it was decided to take further Counsel's opinion upon the point; but, in the meanwhile, it may be of interest to trace the history of Mr. Wright's adverse construction of the statute. This opinion seems to have seen the light at Wells early last year, when the same difficulty cropped up at a meeting of the Town Council, sitting in Committee. The question was referred to the Municipal Corporations Association; and a reply was received that it is illegal for gas shareholders to vote in regard to such questions. The persistence of a Wells town councillor in maintaining his right to vote, drew the attention of an electrical journal to the subject; and the Editor thereupon published Mr. Wright's opinion, with the explanation that it had been obtained by Mr. Sidney Morse, and made known originally by Mr. E. Garcke. It was reproduced in a local newspaper. It is therefore evident that it was in the supposed interest of the electric light industry that the law was invoked to stop gas shareholders taking part in this kind of public business. It appears to the ordinary man, however, that, if Mr. Wright's interpretation of the law is correct, it is a straining of the statute that may, in certain circumstances, work grave practical inconvenience, while it can hardly do very much good at any time. Of course, the converse proposition must equally hold good; and no electric light shareholder upon a local authority can act in the settlement of any gas business. It is easy to imagine a case where a large proportion of the members of a local authority might, for this reason, be incapacitated from taking part in a class of public business in regard to which the ratepayers might desire to have their assistance.

Personal.—The Right Hon. David Robert Plunket, upon whom Her Majesty has recently been pleased to confer the dignity of a peerage, will be remembered by many of our readers as the Chairman of the Select Committee of the House of Commons who had referred to them the London Water Bills of last session. He was born in 1838; was educated at Trinity College, Dublin, where he graduated B.A. in 1859 and M.A. and LL.D. in 1875; and was called to the Irish Bar in 1862. He was appointed Q.C. in 1868, was Law Adviser to the Irish Government in 1868, Solicitor-General for Ireland from 1875 to 1877, Paymaster-General (and Privy Councillor) in 1880, and was First Commissioner of Works from 1885 to 1886 and again from 1886 to 1892. He is a Director of the London and North-Western Railway Company; and he has represented Dublin University in the Conservative interest in Parliament since February, 1870.——Mr. G. F. Cutting, of Hull, has been selected to fill the position of general foreman at the Bombay Gas-Works, applications for which were invited in the JOURNAL for the 10th ult.——The appointment of Mr. F. Gibson, of Carlisle, as Manager of the Chelmsford Gas-Works, has already been announced in our columns. Last Thursday, Mr. Gibson was the recipient of a handsome black marble timepiece as a memento of the good feeling entertained towards him by the officials and workmen of the undertaking he is now leaving.

WATER AND SANITARY AFFAIRS.

LONDON is in perplexity as to the prospects of the water supply. The County Council have negatived a proposal that "the Bills for the purchase of the London Water "Companies be proceeded with." It is true that this decision was arrived at by a bare majority of one. But it was enough; and it was just such a majority which secured the second reading of the Bill of the East London Company in the House of Commons last year. This majority of one seems destined to work wonders in connection with the Metropolitan Water Question. Lord Farrer may be said to have turned the scale on the present occasion, by casting in his lot with the Moderates. Had his solitary vote been given on the Progressive side, the majority of one would have been in favour of going on with the Transfer Bills. The Deputy-Chairman (Mr. Dickinson) declared himself "amazed" at Lord Farrer's attitude on this occasion. From our own point of view, his Lordship's reasoning was none of the best; but his vote was right. The result of the debate was certainly a surprise. The question came before the Council on a report that was presented by the Parliamentary Committee, recommending—as we mentioned last week—that the Council should invite Her Majesty's Government either to deal with the subject of the Metropolitan Water Supply themselves, or else appoint a Royal Commission for the purpose. To this an amendment was moved by Mr. Stuart for proceeding with the Purchase Bills; and it was this amendment which suffered rejection by a majority of one. It could not be called a very small division, though it might have been larger; the votes being 53 for the amendment and 54 against it. Had the recommendation of the Committee been forthwith put to the vote, presumably it would have been carried. But the debate was adjourned; thus opening the way for further amendments. For the present, the Progressives are discomfited. We might say they are astounded. Certainly they are indignant. The *Daily Chronicle* hurls its choicest epithets at the Moderates. Their policy is asserted to be "a policy of blackmail—a trick on the ratepayers—an "insult to the water consumers—a wrong to the poor—a "peril to the community." Mr. John Burns, M.P., threatens that, if things go on in this style, "the Pro-"gressives will no longer feel themselves responsible for "the administration of London government." It happens that London has already gone a long way towards relieving the Progressives of any such responsibility, and may be expected to complete the process at the next election. This dire threat of leaving London to the mercy of the Moderates was even uttered by the *Daily Chronicle* in a leading article on the morning of last Tuesday. If the Progressives failed to get their own way on the water question, it was advised that they should "throw up the reins of power on the Council, and give "the obstructives on the Parliamentary Committee full "responsibility for an odious policy." We can only say, if this is the spirit of the Progressive party, it abundantly proves they are not the proper party to govern London.

The accusation launched against the Moderates is that they have changed their policy, and are opposed to a municipal water supply. "Municipal" is a word to conjure with. "Public authority" is the term used by the Parliamentary Committee, and is a recognized phrase, dating back to the time of the Duke of Richmond's Commission. It is for a public authority that the Parliamentary Committee and Lord Onslow contend. His Lordship boldly declared, in last Tuesday's debate, that "the time "had come when they could no longer allow the water "supply of London to remain with the Water Com-"panies." But Lord Onslow went on to say explicitly that "he joined issue with the Progressive party "as to what should be the Water Authority." The practical help to be derived from a Royal Commission was expressed in three propositions, and yet the organs of the Progressive party see nothing in this proposal but a device to delay the final settlement of the question, and promote the interests of the Water Companies. The proposal to hand over the undertakings to a public authority is also opposed as something which is intended to procure better terms for the present proprietors. Nothing is right unless it is in the hands of the County Council. The Moderates who form part of that body are

attacked by *London* as having "betrayed the interests of "the ratepayers," and acted with "treachery" towards the Council in respect to the water question. On the other hand, a well-toned article in the *St. James's Gazette* congratulates the Moderates on having "reversed the "impracticable policy adopted when the Progressives "were in power." Objecting to a Royal Commission, as unsuitable, the *Gazette* commends the idea of "putting the "whole thing into the hands of the Government," and hopes the Council "will decide boldly to demand a Bill." The Government are urged to undertake the task, seeing that "the responsibility for the new scheme, fashion it "who may, must in the long run rest with the Cabinet." Our contemporary says: "The question is ripe for settle-"ment." We remarked last week: "It is evident that "the Metropolitan Water Question is fast ripening;" but we further said: "There are indications that the fruit is "not likely to be to the taste of the County Council." So we find the *St. James's Gazette* giving weighty reasons why the Council should not have possession of the water supply. But why should a "settlement" of this question necessarily involve any change of proprietorship? The *Daily Chronicle* vehemently asserts that "the water mono-"polies have broken down in their function of supplying "London with a prime necessary of life." Such a state-ment is simply contrary to fact and to common sense. But it is supposed to answer a purpose.

The Staines scheme of storage in connection with the Thames, has been the subject of further reference in *The Times* on the part of Lord Farrer, who seems anxious to know whether, if the plan were carried out, the Water Companies concerned would exercise some new rating or charging powers. Of course, that depends on the wisdom of Parliament, as intimated by Colonel W. T. Makins, who advises Lord Farrer that he will obtain some answer to his inquiry when the Companies give their parliamentary notices and deposit their plans—events "for which he will "only have a short time to wait." With respect to the Welsh plan of the London County Council, an organized opposition is growing up in Glamorganshire and other counties affected by the project. An agitation for a Par-liamentary Commission is talked of. Two long articles in the *Pall Mall Gazette* favour the Welsh scheme, though giving many facts which point the other way. At the adjourned debate on the recommendation of the Parliamen-tary Committee in the County Council to-day, Mr. Beach-croft will move an amendment referring the question of the Metropolitan Water Supply to the Government, without any allusion to a Royal Commission. Colonel Ford has an amendment, proposing that the Government should be asked to communicate its decision to the Council before the reassembling of Parliament, "so that, in the "event of the decision not being acceptable to the Council, "the Council may have the opportunity of reconsidering "the whole question."

Masonic.—Bro. Thomas Acland (Secretary and Manager of the Brynmawr and Abertillery Gas Company) was last Thurs-day installed W.M. of the Homfray Lodge, No. 1562, meeting at Risca.

Imperial Continental Gas Association.—The Directors of this Association recommend the declaration of a dividend of 5 per cent. for the half year ended June 30, together with a bonus of 1 per cent.

Water-Works for Madras.—On Thursday, the 10th inst., the Periyar Water-Works, constructed to supply the Madura district of Madras, were opened by Lord Wenlock, the Governor, in the presence of a large concourse of visitors. Colonel Pennycuick, Secretary to the Madras Public Works Department, has been created a Companion of the Order of the Star of India in com-memoration of the event.

"Practical Gas-Fitting from Main to Burner."—Under this title, Mr. H. O'Connor, Assoc.M.Inst.C.E., who a short time ago relinquished his appointment at Beckton to take the manage-ment of the gas-works apparatus department of Messrs. James Milne and Son, Limited, in Edinburgh, is contributing a series of articles to the *Building World*—a new weekly trade journal which Messrs. Cassell and Company, Limited, started upon its career last Saturday. We lately felt it incumbent upon us to comment somewhat adversely upon a book which professed to be an up-to-date production on this subject by a practical man, but which was really much behind the times. We are sure that Mr. O'Connor's will be free from the defects to which attention was then called, and that the special classes of work-men for whom the publication is intended will peruse—and not merely peruse, but study—his articles with profit.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 842.)

NATURALLY, the feature of the Stock Exchange during the past week was the settlement of the account in the South African market, dominating every other consideration. The air was full of rumours, industriously put about by interested "wreckers;" and a good deal of nervous apprehension was engendered. The other markets held their breath awhile, not daring to move until it was seen how things in the focus of agitation were going to turn out. However, the worst was avoided. Prices fell freely, and weak holders were knocked out; but there was nothing like an important failure which would produce much trouble. The business went through very smoothly, all things considered; and the markets will be all the better for the storm by-and-bye. There is no change in the Money Market. The Stock Exchange requirements elicited better rates; but they could have been met twenty times over. Business in the Gas Market was somewhat more active than in the preceding week. The general tendency in favour of firmness was well maintained. A large number of quotations made substantial advances; and the chief exception to the upward movement was in the same undertaking which retrograded in the week before. Gas-light "A" opened very steady, and touched 297¼; but later prices realized were not so good, though the quotation showed no change. There was nothing worth mentioning in the secured issues; very few bargains being done in them, and at middle figures. Transactions in South Metropolitans were extremely limited. Prices for the ordinary stocks were not very grand; but the debenture stock rose in value. A couple of transactions in Commercial new saved it from absolute stagnation. The quotation of both stocks was slightly, but very inadequately, advanced *ex div.* The Suburban and Provincial Companies were just as quiet as usual; but an unusually large number of them improved upon their old prices. Brentford new, which had been put a great deal too far in front of the old, was brought back a couple of points. The Continentals were again irregular; European rising, while Imperial fell back a point. Among South Americans, Buenos Ayres and San Paulo again moved up. The Water stocks were very quiet; and the only noticeable feature was a smart advance in East London.

The daily operations were: Very quiet business in Gas on Monday; but prices were good. Both Bromley issues rose 1; European, ½; and Malta, ¼. But Imperial Continental fell 1. East London Water gained 2½. Tuesday was not much busier in Gas; and the only move was a fall of 2 in Brentford new. There was a shade more activity on Wednesday; and prices were good. South Metropolitan debenture rose 1; and Buenos Ayres, ¼. Thursday's transactions were much the same. British advanced ½. Friday's business was mostly in Gaslight "A"; figures being only moderate. Bromley new rose ¼. Saturday was quiet as usual; and quotations underwent no further change.

ELECTRIC LIGHTING MEMORANDA.

The Opening of the Bristol Electric Tramway—The Interest of the Bristol Gas Company in the Execution of the Tramway Works—Sufficiency of the Board of Trade Regulations.

SIGNS are multiplying as to the disposition of electricians to turn towards electric traction in the hope of redeeming the fortunes of an industry to which the lighting business has proved so unkind. There has been jubilation in the electrical journals over the opening of the Bristol electric tramway, as being the first example in this country of the application of the trolley-wire system to tramway work in an important city. According to the local newspapers, this event duly came off on Monday of last week, and was "a wonderful success in every respect." We are unreservedly glad of this, for many reasons. It will be a good thing for the electric industry if there should prove to be a fair amount of reasonably paying work to be done in the matter of electric tramway equipment and working in this country; and it will also be good for the community if the generally slow and too often distressing work of horses upon tramways can be superseded by something better. At the same time, we do not share with some of our electrical contemporaries in the confident anticipations they indulge in respecting the effect which even the general substitution of electric for horse traction would have upon the industry represented by them. If there should be ever so much fresh work of this kind to be done, there would be an even greater increase in the number of contractors to compete for it; and after a very short time, that would happen in this connection which has blighted the pros-pects of the firms who laid themselves out for lighting business. One at least of the electrical journals perceives this danger looming through the rosy future which the advent of electric traction for tramways is to bring to the industry, and remarks upon this head: "It will be most gratifying if electric traction is the means of revivifying the condition of some of our manu-facturing firms; but, without desiring to minimize expectations, it is of vital importance that there should not be in tramway

contracts a repetition of some of the methods that have been adopted in electric lighting work. There are manufacturers who can point to long lists of contracts which they have carried out for this and that municipality; but we doubt whether they are a penny the better for it. Others would have been wise if they had retired from business before they commenced. Next to losing a lighting contract, the worst that can happen is to obtain one." This is a bitter saying, but it is doubtless true; and, unfortunately for those whose fate it will be to "face the music," there is no apparent reason why the latter state of the electric manufacturing industry should in this respect be better than the first.

To return, however, to the Bristol tramway. The line is four miles long, running from near the centre of the old city to Kingswood. Bristol is a hilly city; and part of the line has a very steep gradient, which seems to have been too much for the horses formerly employed by the Tramway Company. The streets traversed carry a heavy general traffic; and it remains to be seen whether the electric arrangements will interfere with the ordinary use of the road for other purposes. It is stated, as might be supposed, that the posts and wires do not spoil the appearance of the thoroughfare, and are not in anybody's way. But this again must be regarded as a question for time to answer. At any rate, the Company have been solicitous to avoid giving occasion for complaint in these respects; and although, to avoid making mistakes, the equipment of the line has been entrusted to experienced American contractors, the style in which everything has been done is very superior to that with which most American towns have to be content. On the occasion of the formal inauguration of the line, the eight cars constituting the rolling stock easily covered the distance, including stoppages, in half an hour; and there can be no doubt that such a service will be highly appreciated by the residents of a district which, by reason of the steepness of the roads, has been without railway accommodation. We notice that Dr. Silvanus P. Thompson attended the opening function, and gave his benison upon the undertaking. He told the company present on this occasion that he had been engaged by the Bristol Gas Company and the Water Company to keep an eye upon the execution of the works, and advise them if anything prejudicial should occur. After seeing how the job was being done in all respects, he has formed the opinion that there is not likely to be any trouble from leakage or anything of the sort during the next ten years. A full and elaborately illustrated account of the line appeared in the *Electrical Review* for the 11th inst.

There is not a great deal to be said concerning the electric equipment of this, the pioneer city trolley-wire tramway of the United Kingdom. The large margin of power inevitable in every system of electric traction is also noticeable here; three Willans engines, indicating 135 horse power, being provided in the power-house, which is situated near the middle of the line. There should be no fear, therefore, of the cars refusing to start in any circumstances. There is an admitted risk, in connection with this overplus of power, of the motors being injured by careless handling on the part of the driver. Drivers have to be trained in the matter of starting, which is the critical operation. Afterwards, with a good trolley appliance, all is plain sailing. An interesting feature of the Bristol line is the fact that it is the first to be constructed under the new Board of Trade rules, which have been characterized by some electricians as superfluously stringent. These rules set out, among other things, that the difference of potential between the farthest and the nearest ends of a return shall not exceed 7 volts, and that the leakage shall not exceed 0·01 ampère per mile of tramway. The importance of the latter provision, in the interest of the owners of pipes buried underneath the surface of the roads covered by the tramway, is evident. It is satisfactory to learn that the tests made of the Bristol line show that it is possible to keep well within the Board of Trade limits of difference of potential and leakage. On the occasion of a severe test, when half-a-dozen cars were bunched up at the end of the line, the drop of pressure only amounted to 3½ volts, while the leakage current was 0·01 ampère for the whole length of the line. It is not for gas or water companies to object to electric tramways, if these undertakings can be safely installed and worked. The officials of the Bristol Gas and Water Companies were justifiably troubled in mind during the execution of the works which we have now briefly described; and the attention of gas and water works engineers all over the country may be directed to the Bristol experiment, as a foretaste of what we may get a good deal more of, if the system succeeds upon its merits. It is therefore a matter for thankfulness that the regulations of the Board of Trade have proved proper and sufficient for attaining the end to which they are directed.

Midland Association of Gas Managers.—The autumn meeting of this Association is called for Thursday next, at the Grand Hotel, Birmingham. The technical business will consist of the reading and discussion of two papers—one by Mr. John Young, on "Two Years' Experience of Prepayment Meters;" the other by Mr. W. T. Tew, entitled "An Incident in Purification." The officers for the ensuing year will be elected; and a motion will be proposed, on the recommendation of the Committee, to the effect that future meetings of the Association be thrown open to representatives of the technical press.

WRIGHT'S PREPAYMENT METER.

The history of automatic prepayment gas-meters will perhaps be written some day by a competent authority, who will be able to appraise, with the fairness that distance lends to the view, the comparative value of the labours of the many different hands that have been busied with this particular application of the popular principle of the "penny-in-the-slot." At present, it is only possible to chronicle, as they arise, the appearances upon the horizon of commerce of one after another of the prepayment meters that owe their first introduction to the technical world to the publications of the Patent Office. It has been our duty to commend to the notice of our readers several promising gas measuring and retailing instruments of this order; and in every case we have been constrained to believe that the force of ingenuity could no farther go in the direction of satisfying the requirements of both suppliers and consumers of gas. As time has rolled on, however, it has been made apparent not only that there is an insatiable demand for as many good and reliable automatic prepayment meters as the makers of accepted articles of the kind can turn out, and more; but also that some of the best of these, when put to the practical test, still left something to be desired. All sorts of unsuspected difficulties and hitches have been discovered, and for the most part overcome, in the practical working of the automatic prepayment system; but it appeared by the transactions of the last meeting of the North of England Gas Managers' Association that there still remains a blemish upon the system which, unless and until it is entirely removed, will operate far more seriously to its prejudice than all the cruder troubles due to the trickery of fradulent consumers, and so forth, which at first troubled those who had to do with the introduction of the system. We allude to the alleged frequency of discrepancy between the operation of the prepayment mechanism and the registration of the meter itself. How serious and troublesome this feature of the system—as illustrated by the meters already in the market—may be, is not for us to say; still less is it our task to explain how the trouble arises. The object of the present article, however, is to bring before the gas industry a meter for which it is claimed, among other good qualities, that it is practically and mechanically impossible for the contents of the cash-box and the registration of the meter-index to disagree, for the very simple reason that *the money does not enter the box until the corresponding volume of gas has actually passed through the meter*. This meter is the invention of Mr. Frank Wright, of the firm of Messrs. Alexander Wright and Co., and is being manufactured and placed upon the market by a newly-formed Company called Frank Wright's Prepayment Gas-Meter Corporation, Limited, who have already started large works in London for this purpose.

The general appearance of the meter and the mode of setting it in action are shown by the illustrations given on pp. 826-7. It will be seen, to begin with, that the whole arrangement is extremely neat; the only outside addition to the meter consisting of the money-box on the left-hand side, and another attachment, which is also a money-box, on the top of the case. The former is for money that has purchased gas and is ready for the collector; the latter is for the coppers, or the shillings, as the case may be —for the meter can be set to sell gas by any chosen unit of value—which are actually in reserve for effecting the same operation. The user merely has to lift the latch on the top of the tube, as shown, and insert the coins, of which as many as twenty-four can be accommodated, the exact number thus held in suspense being indicated by a pointer on the front of the tube. An index over the ordinary measurement dials shows how much gas will be dispensed for every penny paid. What happens when money is put into the slot is briefly as follows: The sliding cover to which the latch is attached, and lifts up to take in the money, is a weighted tube that presses down the coins; the first or lowest one coming into contact with the rounded top of a spindle carrying the gas-valve. This valve is kept closed by a counterbalance weight, until opened by the coin in the manner just described. Be it observed that it is not the weight of the coin that is depended on to open the valve, but this weight *plus* that of the sliding cover. After (say) three or four pennies are inserted, the additional weight of the cover is not required; but it is necessary in order to make only one or two coins operative. At the bottom of the tube, there are provided claws, which hold the lowest coins down upon the bearing, and prevent their rising in case the weighted cover should be lifted again for adding more coins. This is an important safeguard. The lowest coin not only presses down the gas-valve, but also drops into a hole cut to take it in a disc-wheel, the rim of which is cut into teeth that engage in a worm-wheel on a sleeve carried upon the first spindle of the index. It is obvious, therefore, that as the worm-wheel turns, it will revolve the disc-wheel, and so cause the latter to carry its coin away from the top of the gas-valve spindle. Not until the allotted volume of gas has passed, and has (in passing) revolved the worm-wheel and the wheel with the penny sunk in it, can the latter clear itself sufficiently to drop down into the shoot that conveys it into the money-box. As one coin drops, another takes its place; and the last coin leaves the gas-valve spindle with sufficient slowness to warn the consumer, by the gradual rise of the valve, and consequent lowering of his light, that it is time to put in more money.

It will be understood from this much condensed description

of a highly ingenious and strikingly simple device, that only one coin at a time is really allowing gas to pass. There is no setting back the index; no drag upon the index to close a gas valve; no passing coin after coin directly into the money-box after it has been made instrumental in pushing some adjustment into place which may or may not work out correctly in harmony with the registration of the meter. The gas-valve is a simple gravity dead-action valve; and the moment the last coin has cleared itself from its operative position, the gas must be shut off—although not suddenly, as already observed. The same attachment will take pennies or half-pennies, and will pass a proportionate quantity of gas for each denomination of coin.

The adjustment of the volume of gas to be dispensed for every unit of cash prepayment is simply made, and can be effected *in situ* after a seal has been broken. It is actuated from the first spindle of the index train—the same that carries the sleeve upon which the worm-wheel already mentioned is mounted. It consists merely of an arrangement of cams and pawls whereby the sleeve in question can be made to revolve with the spindle, or can be made to miss any portion of a revolution up to about one-half. Thus the speed of delivery of the penny from its duty of allowing gas to pass, can be modified within wide limits; and as it is the revolution of the first spindle of the meter-index that does all the work, not only is the operation of the prepayment attachment really automatic and dependent upon the passage of the gas itself, but the accuracy of the adjustment of the two elements of the meter can be brought to the greatest possible nicety.

So much for the prepayment apparatus. The meters, however, that are to be made by the Company named above, will not depend for purchasers upon this attachment alone, but will claim attention for general excellence of design, workmanship, and material, as well as facility for repairs. Mr. Wright has devised a remarkable series of machines for making every part of all sizes of meters; and he has reduced the need for skilled labour in assembling the parts to an astonishing minimum. Moreover, by far the greater part of the soldering that has hitherto gone to the making of the dry meter is also done away with. All parts are made to gauge, and are accordingly interchangeable; and by the adoption of the principle of subdivision of labour, the efficiency and capacity of the factory have been enormously increased as compared with that of an establishment worked upon less advanced principles. It is not too much to say that, if they carry out their programme, the new Company will put a fresh aspect upon the gas-meter trade, since they appear bent upon inaugurating reforms in this most important industry, from which the gas-consuming public can hardly fail to derive much advantage.

PRESERVATIVE PAINTS.

(*Concluded from p.* 777.)

Mr. Wood admits that the production of a paint which is capable of resisting all the destructive agencies already named is a difficult matter. The field is an enormous one; and but little positive knowledge has yet been obtained respecting it, although the investigators and their experiments have been legion, and the literature of the subject fills volumes. This is mainly because time is an essential factor in test of a paint; and if an experimenter is required to wait five or ten years to determine the merits of a paint, or what effect a slight modification of the proportions has upon any one or more of the eight destructive agencies we have considered, a lifetime would easily be spent before a conclusion could be drawn.

Fortunately, to an extent, for engineers, paints for structural purposes are not required to last for a lifetime, but only to keep the structure sound from one periodical overhauling to the next, which is usually no great interval. At the same time, the paint should be as durable as art can make it, for obvious reasons. Mr. Wood's list of acceptable preservative paints comprises the natural and artificial asphalts, with their compounds; iron oxide paints; zinc and lead oxides and carbonates and other metallic paints; carbon paints—all of which he discusses *seriatim*. We shall summarize the information given by his paper upon these matters. As to natural and artificial asphaltic coatings, Mr. Wood states that, "with proper care in their preparation, in order to eliminate the ammonia and organic matter subject to decomposition and the formation of corrosive acids, and when applied hot to clean, dry surfaces free from mill scale, and warmed to any degree under that of boiling water, they are not only cheap in cost, but seldom need renewal, and form one of the best of protective coatings." Upon iron oxide paints, Mr. Wood is decidedly unorthodox—declaring that such paint, as he knows it, is anything but protective to ironwork; and he cites Mr. Emil Gerber as another heretic in this regard. These observations are depreciative in value by the omission of all reference to paint made from natural oxide, which does not appear to occur in the United States, since both Mr. Wood and Mr. Gerber write only of such paint when made from artificial sesquioxide by different methods.

As to zinc oxide paints, Mr. Wood states that they are most unsatisfactory by reason of their tendency to peel off from metallic surfaces, as already mentioned. When mixed with red lead, in the proportions of one-quarter to one-third of the zinc to three-quarters to two-thirds of red lead, ground together in raw linseed oil, the result is improved, but the paint sets slowly. White lead paint forms a very effective coating for ironwork, if it is protected from atmospheric influences. Mr. Wood also speaks favourably of sublimed lead paints; and he describes red lead as perhaps the oldest mineral pigment known. He declares that there is no other pigment used as a protective covering for all kinds of surfaces that gives such uniformly satisfactory results as red lead. One ounce of lamp-black added to every pound of red lead in powder, mixed together dry before the oil is added, changes the colour to a deep chocolate, and prevents the red lead from taking its initial set with linseed oil so quickly as when the lead is mixed with oil alone. This compound will remain in paste form for thirty days without hardening.

Mention is made of the use of manganese dioxide ore (pyrolusite) as a preservative paint. This application of the material is patented in England, and paint made from it is credited with the power of forming a film of magnetic oxide on iron surfaces. The natural colour of this pigment runs from dark steel gray to black. The formation of magnetic oxide upon the surface of iron and steel by the action of manganese is of extensive industrial application; articles being plunged into a bath of melted nitre containing a small amount of the peroxide, which imparts to them a permanent non-corroding coating of a deep bronze colour. The formation of the magnetic oxide film by the agency of paint, however, is a very obscure phenomenon. Personally, Mr. Wood appears to prefer what he calls carbon paints. He holds as a matter of opinion that the waterproof anti-corrosive paint of the future will be made from asphalt oils—oils produced by the distillation of natural asphalt—as the medium for some of the carbon group of pigments; the drying element being furnished by some strong metallic salt, with which he includes iron oxide. Amorphous graphite makes a good paint, although lamp-black is almost as great a favourite with Mr. Wood; and if one must have bulk in a pigment, he seems to hold that gypsum will answer the purpose more harmlessly than any other inert substance.

And now, what is the lesson to be drawn from these exhaustive observations upon pigments and paints intended for the preservation of structural ironwork? How and with what shall the gasholder, the viaduct, or the pier be painted? In this part of the world, at any rate, oxide of iron paint, specified to be made from the natural oxide, is generally employed for such work; and there is nothing in Mr. Wood's article to disparage this kind of paint. Tar paints and black varnishes, we also know; and very good these are for many uses. But it can be safely averred that the black colour is against them for a great variety of applications; and the same hue will militate against the universal adoption of carbon paints. Oxide of iron paint is preferred to tar or to lamp-black largely for its colour; and, when made from the proper material, it is quite deserving of adoption for its preservative qualities. That such a paint exerts an actively beneficial effect upon the metallic surfaces covered by it, we do not believe; but it is credible that its feebly oxidizing action upon the oil, keeps the mass in a proper condition for protecting the iron (if originally free from corrosion) from atmospheric and other external influences detrimental to its durability. The best natural oxide for paint making is probably that found in certain deposits where the oxide exists in natural combination with silica, and where neither carbonate of lime nor alumina is in excess of 5 per cent.—the proportion of ferric oxide being not less than 40 per cent. nor above 53 per cent., with not a trace of sulphur or acid. With such a material, the oxide forms the basis of attachment to the iron or steel surface, and duly oxidizes the medium; while the silica in combination with the small proportion of lime, alumina, and borates present in the paint as mixed with boiled linseed oil, tends to form a kind of enamel glaze upon the hardening surface of the applied paint. Paint which is nearly all oxide of iron can be made by roasting hematite ore, and grinding the product with oil. But the trials that were made in America with paint so made were anything but satisfactory. The fact is that too much oxide is not good for the oil, which is then oxidized too quickly and rendered natureless, so that the paint eventually powders off.

Of course, there are paints and paints; but there certainly is still good reason for the belief that standard articles of trade—such as red oxide of iron or red lead paint, when bought of respectable firms with a reputation at stake upon every consignment, will as a rule be found to justify their commercial and technical eminence. Such paint as we have in mind, well laid upon iron or steel previously made clean and dry, will last as long as can be expected of any covering composed of materials one at least of which—the vehicle or medium—is by its nature perishable when exposed to air and moisture.

Holophane Globes.—Application has been made by MM. Psaroudaki and Blondel to amend the specification of their patent No. 19,185 of 1893, for improvements in the diffusion and distribution of light by means of holophane globes. An abstract of the specification was given in the Journal for Oct. 2 last year (p. 651); and the proposed amendments are set forth in the Official Journal of the Commissioners of Patents for the 2nd inst. (p. 1039).

TECHNICAL TERMINOLOGY.

One of the most interesting of the many scientific and technical periodical publications of America is the *Engineering Magazine*, which is conducted in so catholic a spirit that followers of almost every branch of the profession from which it takes its title can usually depend upon finding something worthy their attention in every number. In the current issue, for example, there appears a brief but pointed article upon the subject of engineering terminology, fortified by references to certain terms put in circulation and used by gas engineers and their coadjutors among mechanicians. This is a subject that always appeals to us with peculiar attractiveness, as it is one of the responsibilities of the Journal to observe and hold up a high standard of purity and simplicity as regards the phraseology of gas engineering. There must, of necessity, be a difference between the technical and the ordinary colloquial or literary use of words, inasmuch as in the realm of technics, which exists within the circle of everyday life, a special kind of verbal currency is indispensable. All technicians and specialists have to agree, by common consent, to attach peculiar meanings to certain terms. Some of these are never heard out of their company; while others have quite different significations in popular parlance. We cannot stop to explain to one another what we mean by these expressions; it is sufficient that those who use them in a particular sense know what they are about, and are confident of being understood. At the same time, this specialized employment of words, particularly of words which already mean something else, is a matter that must be carefully watched if technical language is not to become mere jargon. When educated men talk "shop," in "shoppy" terms, they owe it to the common language of their race, that the supreme rules of composition, grammar, and spelling shall be observed; and that the risk of ambiguity which is inseparable from the employment of common phraseology to express some special meaning, shall be reduced as far as possible. It was for this reason that, when the list of papers to be read at a recent gas managers' congress appeared with one communication bearing the title "washing," we drew attention to the term as being vague to the verge of ambiguity, with the result that it was afterwards corrected.

It is easy to see how errors of this kind come about. As the article to which we have referred observes, "there seems to be a tendency, when a new term is wanted for a thing or operation in practical mechanics, to seize upon the name which has been used in the shop where the thing or operation originated, regardless of its mechanical or scientific fitness to express all that it should." And there is more reason than might be suspected at the first glance into the matter, for this subservience to shop terminology. The common people are the greatest makers of language. As one of the most scholarly of living poets has admitted, the unlettered workman or peasant, when he talks at all, talks better than scholars or literary persons, because his words go so much closer to the realities of the subjects with which the speaker has to deal. Literature and scholarship are not life, but work in the factory or on the farm is life stripped of all conventionalities. Hence the worker usually talks as directly as he hammers or digs. So it frequently happens that the handworker hits as if by instinct upon the most telling term for a new process or operation. Sometimes, however, a man with a smattering of culture undertakes to name a thing; and then the result is apt to be confusing. Our American contemporary seizes upon this aspect of hap-hazard technical terminology; and the first example cited in point is a term in regard to which we have, with contrition, to confess that we and our readers have often sinned. This is no other than the now familiar term "producer gas." This is employed, as the accusing article states, to signify gas made in so-called "gas producers," for use in gas-engines and so forth; the intention being to distinguish this kind of gas from ordinary illuminating gas. "Now, the term 'producer gas' has in it nothing which, to one not previously instructed in its nature and uses, conveys the slightest notion of what it is, except the idea that it is some sort of gas artificially produced. But this is true of most gases; so, in reading about the increasing use and efficiency of gas-engines which use this gas, the lay reader—after vain search for light on the nature of the difference between this gas and illuminating gas—is forced to content himself with half-knowledge. The term 'gas producer' is equally open to criticism; it really defines nothing." This is perfectly true; and the indictment might be drawn even more strongly, by referring to the aggravating circumstance that there is good reason to believe that not infrequently those who talk about producer gas are not free from intent to deceive, inasmuch as they may have in mind one variety of this product, whereas those whom they address may, to their knowledge, have learnt to think of it as something quite different. One man talks about producer gas, meaning all the time the product of the imperfect combustion in a mixed current of air and steam of anthracite coal; his hearers may only know of such gas as made in a similar way from coke. In all such cases, however, the point is clear, that the use of the term in this way implies the knowledge, to a degree that may be pardonably regarded as excessive, of the technical process and its antecedents and circumstances.

Our contemporary goes on to allege—in this regard following the lead of another publication, the *American Machinist*—that, "in the art of using gas in heat-engines, there has been a singular outcrop of such insignificant terminology." Let us pause awhile to enjoy the full flavour of the incidental use of the good old word "insignificant" in its original meaning of devoid of significance. How sadly the language has been impoverished by the degradation of such words as this, with which might be cited "impertinent," "indifferent," and "advertisement," until to the uninstructed ear they convey so much lower a meaning than that originally expressed in them! To return to the point, which is that one of the terms applied to the gas-engine is that of "impulse-engine"—the complaint is made that such a term not only fails to express the facts relating to the combustion and expansion of gas in engine-cylinders, but that as so used, it conveys to most readers an entirely erroneous idea. The article runs on as follows: "To invent a new word, or even a new application of a standard word, is to incur a great responsibility in any event; and in the case of an incorrect application of the word, it may cause serious trouble and misunderstanding. Someone has begun the practice, and now it is quite a common one, of speaking of the gas and oil engines of the day as 'impulse' engines. The idea intended to be conveyed, of course, is that power developed by the engine and taken from the driving-shaft for practical uses, is first imparted to the piston suddenly, and all at once, at the instant that the explosion occurs. The use of the word 'impulse' in this connection—meaning by it a sudden application of force—is incorrect, misleading, and libellous. In speaking of the ignition and rapid combustion of the charge as an explosion, we are probably contributively culpable. The expression suggests not only an unsteadiness of revolution in the engine much greater than actually occurs, but also strains upon bearings, connections, and frame that are never encountered." It is then argued that gas-engines, so far from being driven by "impulse," are instead more truly expansive engines than any steam-engine that ever existed, because in them expansion takes place from the very beginning of the stroke, while in the steam-engine only after the cut-off is the work of expansion done.

The error in question must be regarded as confined to the land of its origin; for nobody in England has ever poisoned the technical literature of the gas-engine by calling it an impulse-engine. If any formula intended for use as a descriptive title of such motors has ever had even a limited circulation in lecture-rooms, it is that which classifies gas and oil motors as "internal combustion engines." So far from the term impulse having been applied, with us, to the work done in the cylinder of a gas-engine by the charge, we may claim for the Journal the distinction of having put the question some time ago of when the advent of an "impulse" gas-engine—a gas-engine, that is, driven by impulse, like the steam-turbine—might be looked for.

To return to the first subject, of the misleading character of the term "producer gas," and even of "gas producers"—we have confessed and expressed contrition; and now it remains to be asked, how is a repetition of the inaccuracy to be avoided? Frankly, we do not know. Whoever may be responsible for the initial error, the fact remains that, for industrial purposes, combustible gases are classified as coal gas, water gas (carburetted or otherwise), producer gas, and generator gas. If an illuminating or a fuel gas is not one of these, it must be another, or a mixture of two or more of them. In one sense, it might be possible to speak of more than one of them as coal gas; but convention has fixed what this term shall be understood to mean. Producer gas is at times spoken of by some proprietary name—as "Dowson" gas; just as what technicians know as generator gas is occasionally called Siemens gas. The truth of the matter is that a sufficiently precise meaning in the technology of gas manufacture has become attached to the word producer; so that it is rather late to impeach the term in the supposed interest of the "lay reader." This individual must "get up" the accepted terminology of the gas industry, as he must do that of any other, if he desires to confer upon fairly equal terms with its actual practitioners. Let a lawsuit affecting gas producers or producer gas once get into Court, and although it will be necessary to start by instructing the Judge in the proper technical meaning of these terms, he will not need to be told twice. As with the Court, so with the man of business—the circumstance of there being any number of other meanings to a word does not affect the particular one that may happen to be in question.

The *Engineering Magazine* concludes its article upon this subject with an observation which must have escaped the writer by inadvertence. It is to the effect that "a literary and scientific bureau of experts, to which new technical terms might be referred for approval, before their use could be regarded as authorized, would be very useful. The work of such a bureau might profitably be extended to the revision of terms already in use. The number of words now used in the Arts as technical terms is great. Different words are used in different English-speaking countries to signify the same thing; and even in the same country in different localities things are called by different names. Many an American reader perusing an English technical paper will find terms entirely unfamiliar to him, which, when he has ascertained their meaning, he discovers to be used to indicate familiar things or processes. Difficulty and confusion are thus created, that might be easily avoided by the authoritative action of some competent body in the adoption or

exclusion of technical terms." With all respect to our contemporary, this is nonsense. The English-speaking world—albeit only the proportion of the whole which speaks English on occasion in technical senses—is not going to put itself into leading strings. The dreadful fate that has overtaken our American cousins through their misplaced confidence in "authority" in the matter of spelling, would of itself be enough to frighten Englishmen from such a course. The only authority that can be recognized in these matters is the general body of educated public opinion, as signified through the usual channels of contemporary literature and journalism. Every editor of every journal is, in effect, a professor belonging to the world-wide faculty of the cultivation and improvement of language as a medium for the expression of thought. It is part of his duty—a duty, unfortunately, not always perfectly realized or performed—to watch for the slip-shod diction, the ungrammatical or obscure sentence, the ambiguous term, the misleading or imperfect appellative, which will creep into the writings of the most careful author, as they are the besetting weaknesses of the half-educated and careless, and to keep them out of circulation. Only in this way can the language be kept even passably clear. Happily, much may be effected by this agency, as experience abundantly proves. But there exist in the technical and general press a number of periodical publications of a low class, the conductors of which seem not to care how often they offend against the canons of the language which they know only imperfectly and are only able to use more or less badly. Self-respecting readers, however, do not waste time on such trashy productions. Fortunately, these journals never originate anything—not even a wrongly-applied technical term; so that their power for mischief in this respect is small.

Incandescent Gas Lighting in Streets.—The experiments in connection with the lighting of the public streets of Siegen by means of Auer incandescent lights have proved so successful that it has been decided to adopt the light on a large scale.

Railway Carriage Lighting by Gas.—All the carriages which now leave the South-Eastern Railway works at Ashford are fitted up for gas in place of the old oil-lamps; and the Company are making extensive use of gas with a view to adopting it as the sole illuminant on their system. Some 800 carriages are already provided with it—the gas being manufactured at the Company's works in London; while, in order to meet the increased requirements in this direction, they are having large works erected at Rotherhithe. Each coach carries a pair of gasholders underneath, capable of containing a supply for 25 hours. They are replenished at different depôts on the line.

An Improved Asphalte.—A new kind of asphalte has been brought out by Mr. J. Wetherill, the former Borough Surveyor of Keighley. The present mode of preparing asphalte is by softening the pitch with creosote oil or coal tar, so that when cold it shall be tough, and not brittle in any way. It is found to melt with the heat of the sun in summer on a clear day, and to run out of the joints of the paving on the surface of the road, filling up the channels and gulleys. In cold weather and frost, it becomes very brittle, and crushes with the vibration of the traffic passing over the road, and is afterwards removed by the scavengers. Mr. Wetherill's asphalte, which is said to avoid these defects, is made in the same way, with the exception that less oil or tar is used, and lime is added; thus hardening it in summer and softening it in winter. It is claimed for it that it will change as the weather changes from hot to cold, and will always keep a tough and reliable joint impervious to wet and frost.

Corporation Extravagance—Under the title of "A Citizens' Auditor's Notes," Mr. S. Norbury Williams has been criticizing in a trenchant yet withal good-humoured style, in the *Manchester City News*, the items of expenditure in connection with the opening of the Thirlmere Water-Works on the 12th and 13th of October last year. The expenses for the two days amounted to £1368 15s. 9d.; the cost of providing the dinner for 330 persons on the second day being £325 15s. 5d. Mr. Williams characterizes all this as "a scandalous piece of unnecessary waste in these hard times, when the rates are always increasing, and are likely to rise shortly to the biggest figure they have ever reached in Manchester." He says that, if there were six men of backbone in the Council, these outrageous items of waste would be stopped. But there are not. To move in the matter would mean being boycotted; and this councillors cannot endure. Consequently, aristocrats and "labour" members alike acquiesce in these spendthrift outlays; and there is not a pin to choose between them. Mr. Williams has searched the Treasurer's abstracts of receipts and payments, with the aid of one of the oldest of the financial officials, in order to find an entry of the £1368; but they gave up the search as a puzzle. However, the riddle was solved on turning to the water-works ledger; for there they found that all the items he had been criticizing had been "lumped in" with a number of others in the water-works capital account as follows: "Thirlmere Works—Aqueducts, pipes, &c., £68,804 14s. 1d." Mr. Williams rightly regards this as a piece of concealment worthy of strong condemnation. It seems that Manchester spent rather heavily last year on luxuries. The Queen's visit cost £5467; the cleaning and furbishing of the Albert and John Bright statues, £630; and opening the Thirlmere works, £1368—a total of £7465.

TECHNICAL RECORD.

WRIGHT'S PREPAYMENT METER.

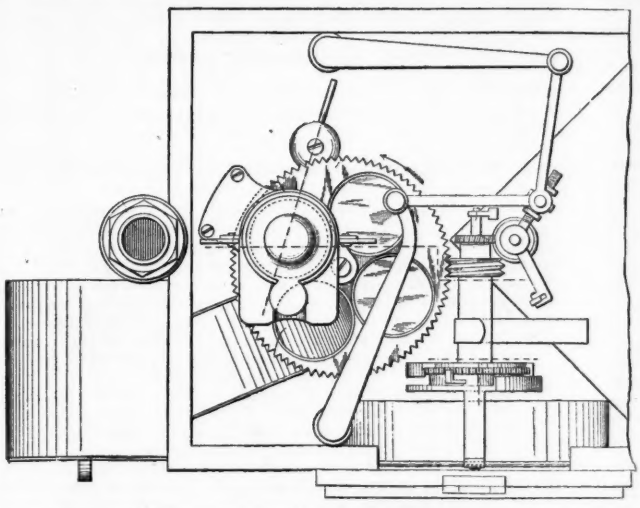
In our "Essays" columns to-day, an article will be found on the subject of the above-named meter. In order to make the description as complete as possible, we give below a perspective view of the meter, and on next page two diagrams showing the working parts of the prepayment attachment.

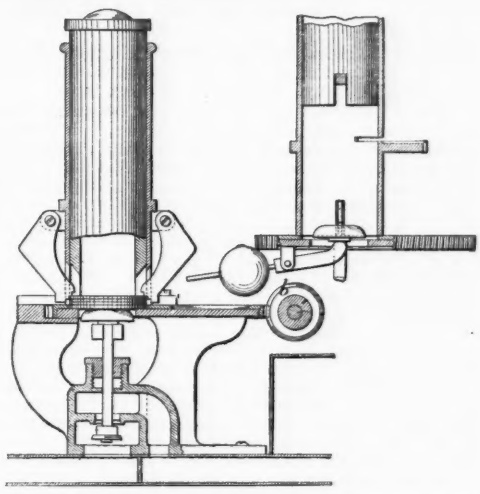
THE PROPERTIES OF LIQUID ETHANE AND PROPANE.

The following article on the above subject was contributed to *Nature* by Mr. A. E. Tutton.

A comprehensive study of the properties of these primary hydrocarbons in the liquefied condition has been made by Dr. Hainlen in the laboratory of Professor Lothar Meyer at Tübingen; and an account of his work will be found in *Liebig's Annalen*. Owing to the greater ease with which it undergoes liquefaction, propane was first investigated. The hydrocarbon was obtained in a state of purity by means of the admirable method of preparation discovered in the same laboratory in the year 1883 by Köhnlein, which consists in heating propyl iodide with aluminium chloride in a sealed tube to 130°. After subjection to this temperature for twenty hours, the tube was allowed to cool, and subsequently placed in a freezing mixture. While immersed in the latter, it was found practicable to open it without danger or loss—the accumulated gas being readily transferred to a gasholder over water.

In order to determine the boiling-point of propane, the purified gas was first condensed to the liquid state in a U-tube surrounded by solid carbon dioxide. It was then transferred to the special boiling-point apparatus by evaporation and recondensation; the last traces of impurities being eliminated by this process of repeated distillation. The special apparatus consisted of a glass tube closed at the lower end, furnished with a side tube for the entrance of the gas, and with a stopper at the open end perforated for the passage of an exit-tube and a thermometer. The upper half of the cylinder was surrounded by solid carbon dioxide, and the lower portion was protected by a mantle of badly-conducting felt. Upon the entrance of the gas, the air was expelled by the exit-tube; and the gas which condensed in the upper portion of the cylinder collected in the lower portion. When the protecting mantle was removed, the relatively warm air soon promoted ebullition; and the escaping vapour was as rapidly recondensed in the cooled upper portion of the cylinder, and fell back into the lower. If the hand were brought into the proximity of the cylinder, the boiling became most vigorous. At first propane usually boils irregularly—quiescent intervals being succeeded by almost explosive ebullition. But after a short time the formation of vapour becomes perfectly regular; and a mercury thermometer dipping in the liquid registers a temperature of − 38°. After comparison of the latter with an air thermometer, the correct temperature of the boiling-point of propane is found to be − 37° at 760 mm. pressure.





Propane may safely be sealed in strong glass tubes after condensation by means of solid carbon dioxide, and thus preserved in the liquid state. It is a perfectly colourless liquid, but much more viscous than liquid carbon dioxide. The critical temperature was determined by use of such a tube half filled with the liquid. The tube was immersed alongside a thermometer in a bath of liquid paraffin, furnished with a suitable stirrer. Upon heating the apparatus to 101°, the liquid meniscus commenced to become hazy, and the distinction between gas and liquid became less and less pronounced, until at 110° all trace of it had disappeared. Upon cooling, the well-known nebulosity was observed at 102°; and this temperature is considered to be a close approximation to the critical temperature of propane.

The vapour pressures of propane for different temperatures up to 12·5° were determined by enclosing a quantity of the liquefied hydrocarbon in one limb of a U-tube, and dried air in the other limb; the two being separated by means of a short column of mercury. The closed apparatus was then cooled to various temperatures in suitable baths, and the vapour pressures calculated from the amount of compression of the air-column. The vapour pressures for temperatures superior to the ordinary were determined by use of the Cailletet apparatus and spring manometer. The following table represents a summary of the results:—

Temperature.	Pressure in Atmospheres.	Temperature.	Pressure in Atmospheres.
Deg.		Deg.	
− 33	1·8	+ 1·0	5·1
− 19	2·7	+ 5·5	5·9
− 15	3·1	+ 12·5	7·1
− 11	3·6	+ 22·0	9·0
− 5	4·1	+ 53·0	17·0
− 2	4·8	+ 85·0	35·0
		+ 102·0	48·5

The critical pressure of propane corresponding to the critical temperature of 102° is consequently 48·5 atmospheres.

Dr. Hainlen has also determined the density of liquid propane at several temperatures. It is 0·536 at 0°, 0·524 at 6·2°, 0·520 at 11·5°, and 0·515 at 15·9°, compared with water at 4°.

An investigation of the properties of liquid ethane upon similar lines naturally presented greater difficulties, on account of the further removal of its boiling-point from the ordinary temperature. The pure gas cannot be so conveniently prepared by the method of Köhnlein, as the sealed tubes frequently explode with great force. It was therefore obtained by the well-known method of Gladstone and Tribe from ethyl iodide and the zinc-copper couple. A mixture of ether and solid carbon dioxide is insufficient to effect liquefaction of the gas; but liquid ethylene was found to bring about the necessary reduction of temperature, which latter was measured by a copper-silver thermo-element. Liquid ethane in the pure state is perfectly colourless.

The boiling-point of ethane was determined as in the case of propane; the upper part of the apparatus, however, being surrounded by the liquid ethylene instead of solid carbon dioxide. The ethylene was prevented from vaporizing rapidly by allowing the extremely cold vapour produced by the evaporation to pass through an outer cylinder, and thus to act as a protective cold bath. The ethane was first cooled by means of ether and solid carbon dioxide before admission into the boiling-point apparatus, after which it was found to be rapidly condensed by the colder ethylene. One end of the thermo-element was immersed in the accumulated liquid instead of a thermometer. The temperature of the liquid when in regular ebullition, produced by removing the cap protecting the lower half of the cylinder, was found to be − 89·5° at 735 mm. pressure.

Liquid ethane cannot be sealed in a glass tube without considerable danger. Hence the determinations of vapour pressure and density were effected by the use of a modified Cailletet compressing apparatus and spring manometer. The various temperatures were obtained by surrounding the narrow thick-walled glass tube in which the liquid was produced by suitable baths. The critical temperature at which the curious cloudy appearance was observed, just before the complete disappearance of the liquid meniscus, was found to be 34·5°, and the corresponding critical pressure 50 atmospheres. The meniscus becomes hazy at 32°, and only disappears completely at 40°; so that the critical temperature, as in the case of propane, does not appear to be so sharp as with many other liquids of low boiling-point. The following table represents the vapour pressures for a few intervals of temperature:—

Temperature.	Pressure in Atmospheres.	Temperature.	Pressure in Atmospheres.
− 31°	11·0	0°	23·3
− 20°	14·5	+ 15·0°	32·3
− 11°	18·3	+ 34·5°	50·0

Professor Dewar in 1884 determined the critical temperature and pressure of ethane, and gave them as 35° and 45·2 atmospheres. M. Cailletet had previously stated that at + 4° the gas exerted a pressure of 46 atmospheres. Professor Dewar's numbers are now found to be in close accordance with Dr. Hainlen's results; and the other statement of M. Cailletet must therefore be taken as founded upon an error. The density of liquid ethane was found to be 0·446 at 0° and 0·396 at + 10·5°.

It may be interesting to compare the facts now established with reference to ethane and propane with those previously well ascertained for marsh gas and for normal butane:—

—	Boiling-Point.	Critical Temperature.	Critical Pressure.	Density in Liquid State.
	Degrees.	Degrees.	Atmo.	
Methane (CH_4)	−164 (Olszewski)	− 81·8 (Olszewski)	54·9	0·415 at − 164°
	−160 (Wroblewsk)	− 95·9 (Dewar)	50·0	
Ethane (C_2H_6)	− 89·5 at 735 mm.	+ 34·5	50·0	0·446 at 0°
Propane (C_3H_8)	− 37·0 at 760 mm.	+102·0	48·5	0·536 at 0°
n-Butane (C_4H_{10})	+ 1·0	..	..	0·600 at 0° (Ronalds, 1865)

If the above boiling-points are represented graphically along with those of the higher normal paraffins, molecular weight or the number of carbon atoms being taken as abscissæ and boiling-point as ordinates, a perfectly regular curve is obtained, slightly concave towards the axis of abscissæ, which very clearly indicates the dependence of the boiling-point upon the molecular weight.

The German Patent for the Incandescent Gas-Light.—The German Incandescent Gas-Light Company a short time ago instituted a number of lawsuits against persons who, as they alleged, were infringing their patent. The first of the cases—an action brought against Herr Fritz Trendel in respect of the "Diamond" light—has lately been decided in the Company's favour by one of the Berlin Courts. The defendant has been forbidden, on pain of a penalty of 1000 marks for each infringement, to manufacture, sell, circulate, or use any burners for the incandescent gas-light, where a firm body, wholly or partly in or over the mouth of the burner, is applied for the purpose of preventing explosions in the flame at that place (thereby obviating noise by the flame), and on which a capsule is arranged round the firm body, the lower end of the tubular incandescent body being so drawn over it that the right position in the hottest zone of the flame is ensured. By this decision, a most important point has been established as far as Germany is concerned—viz., that, in addition to the patent covering the mantle, it applies also to the burner itself. The Company therefore believe that the other actions will be decided in their favour. It appears that the German Patent Office are going to investigate the question of the incandescent bodies; and the Company consider that, as matters stand at present, the proceedings taken in this connection will likewise terminate favourably.

REGISTER OF PATENTS.

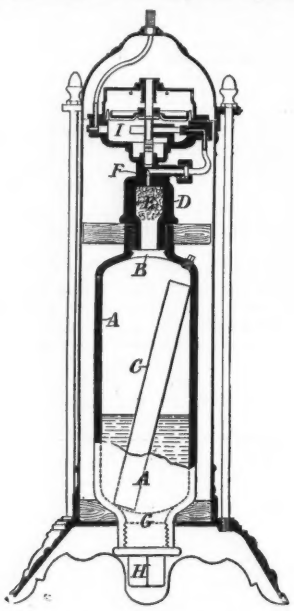
Gas Motor Engines Working with Slow Combustion.—Abel, C. D.; communicated from the Gasmotoren Fabrik Deutz, of Koeln-Deutz, Germany. No. 21,829; Nov. 12, 1894.

This invention refers to the working of two-stroke slow-combustion-cycle gas motor engines, whereby compressed air or inert gas only is introduced into the cylinder during the first part of the outstroke, after which combustible mixture under pressure is admitted, and gradually burnt during its inflow; the hot combustion gases being made to expand from the time when such inflow is cut off to the end of the outstroke, and being afterwards expelled during the instroke.

The rear end of the engine cylinder is provided with an inlet-valve for the combustible mixture of gas and air under pressure; the gas being forced in by a pump worked by the engine-shaft, while the air enters from a reservoir for compressed air charged by a pump worked by the engine, or otherwise—the air being made to mix with the gas on entering through the valve. A second air-admission valve is provided, also communicating with the reservoir under pressure, through which the preliminary charge of air is introduced during the first part of the outstroke. These valves are operated by a countershaft, driven at the same speed as the engine-shaft, and having cams acting on levers connected to the valves, and so arranged that the cam for the admission of air under pressure alone opens the corresponding valve at, or slightly before, the commencement of the outstroke, and allows it to close shortly afterwards. On the other hand, the cam for the admission of combustible mixture opens the valve after the piston has performed a certain portion of its outstroke, and allows it to close after a further portion of the stroke has been performed. The countershaft has another cam, acting on the discharge-valve of the engine, so as to open it at the commencement of the return stroke.

Lamp for Burning Acetylene Gas.—Gearing, E. G., of Harrogate. No. 22,183; Nov. 16, 1894.

This invention refers to apparatus to be employed in generating acetylene gas from calcic carbide, and burning it in a portable lamp.



A is the generating vessel (of steel or iron), cylindrical in form, with hemispherical ends, and conveniently (though not necessarily) about 4 inches in diameter and 16 inches in height. It is constructed with an opening B at the top, through which water can be introduced, as also sticks or pieces of prepared carbide C. The opening is fitted with a screw-plug D, containing a small chamber E filled with asbestos, and with a small hole F through its top. There is a supplementary opening (normally closed by a plug), through which the vessel A can, when necessary, be supplied with water without removing the screw-plug D. In the bottom of the generating vessel also, there is a hole G, furnished with an appropriate closing device, such as a screw-plug H, by removing which the interior of the generating vessel can be cleared of the material remaining as a product of the decomposition which occurs in the process of generating the gas. Above the small chamber E is a reducing-valve I, which is screwed into the chamber E, and with which the small hole F communicates; and above the reducing-valve there is arranged the burner (which is not shown, but may have the usual fittings), a tap or cock being interposed.

For generating gas in this lamp, the carbide is prepared as follows: The patentee takes calcic carbide, produced by the direct action of lime on carbon in the electric furnace, and makes it into "cartridges," sticks, or pieces of convenient size, which are coated on the surface with a film of soluble substance—such as gelatine, glue, or soluble varnish—to protect them from the action of the moisture in the atmosphere. It is preferable, says the patentee, to cast the molten carbide direct from the hearth of the furnace into sticks or blocks of convenient size, as he finds it then less liable to be affected by air than if crushed and rammed into cartridge form. Approximately 1 lb. of calcic carbide will form a stick about 1¼ inches diameter and 12 inches long; and when decomposed by water, it will yield 5 cubic feet of acetylene, which, in a cylinder 16 inches long by 4 inches in diameter, will develop an initial pressure of about 800 lbs. on the square inch. As the water in the generating vessel dissolves the protective coating from the surface of the carbide, the generating process commences; and the acetylene liberated is compressed in the generating vessel under the pressure created by its evolution. With such a lamp as is above referred to, which will maintain its flame for many hours, a light has been obtained of some 45 candles when only consuming about one cubic foot of gas per hour.

Burners for Gas Stoves and Fires.—Wright, G. E., of Birmingham. No. 22,983; Nov. 27, 1894.

According to this invention, the body of the burner is made in longitudinal halves bolted together. There are in it two parallel channels, separated by a diaphragm or partition having in it a series of rectangular recesses, open at one side, and resembling generally in shape the "key pattern." The open sides of the several recesses are in communication alternately with one or other of the two parallel channels separated by the diaphragm. In these recesses, the gas-jets (arranged in line) are placed so that alternate jets open into one of the parallel channels, and the intermediate jets open into the other parallel channel. The gas-supply pipes are situated respectively at the open ends of a divided supply channel parallel to, and cast with, the inner channels. One of the outer channels opens into one of the inner channels, and feeds the combustible gaseous mixture to the jets in connection with it; while the other outer supply channel feeds the intermediate jets in communication with the other inner channel. By opening one of the pipes at the middle of the burner, alternating jets of the series may be supplied with the gaseous mixture; and by opening the other pipe, the intermediate jets of the series are supplied. By opening both pipes, the whole row of jets may be put into operation. In this way independent control over the two series of jets of the Bunsen burner is obtained.

Effecting the Noiseless Exhaust of Gas and Other Engines.—Lake, H. H., communicated from C. Löper, of Lichtenberg, Germany. No. 25,140; Dec. 27, 1894.

This apparatus for the noiseless discharge of waste gases from gas and other engines has for its characteristic features a conical chamber, tapering in the direction opposite to that in which the waste gases pass; the chamber (packed or not outwardly with a soft material) having at its larger extremity the discharge-pipe leading into the atmosphere, and provided in its interior with a pipe, secured against undesired alteration of position, the outlet-passage of which is stopped with a porous substance impeding the outflow of the waste gases. The sound-deadening device consists of a pipe enlarged at one extremity so as to form a box, while at the side is arranged a conical chamber held in place in a tubular piece fixed to the pipe, and which contains in its interior a pipe passing through the whole of its length and into a box-shaped part. A shorter pipe leads back from the box toward the tubular piece fixed to the pipe.

Incandescent Gas-Lamps.—Denayrouze, L., of Neuilly, France. No. 4494; March 2, 1895.

The claims for this invention are: (1) The intimate mixture of air and gas, and its supply to the burner at no sensible pressure, by means of a mixer in form of a fan. (2) The arrangement of air supply by tubes surrounded by annular passages for gas. (3) For driving the fan, the electric motor described. (4) The command of the gas supply to the lamp from a distance by means of an electrically opened valve. (5) The command of the kindling of the lamp from a distance by means of an electrically opened valve, causing a lighting spark. (6) The general construction and arrangement of lamp described with reference to the drawings.

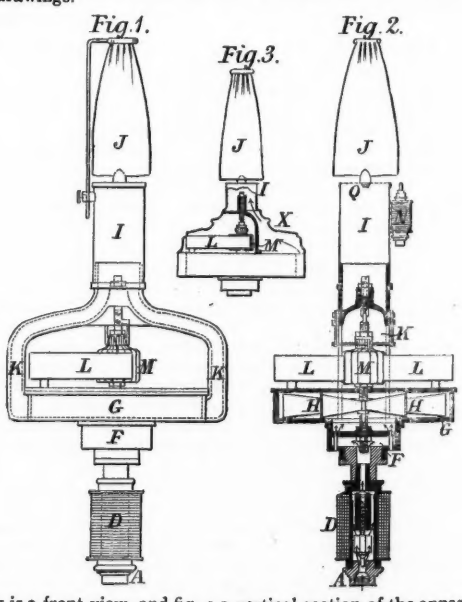


Fig. 1 is a front view, and fig. 2 a vertical section of the apparatus.

The gas enters at A through a valve attached to the moveable iron core of a solenoid D. Above the moveable core is a fixed one, having a central screw, which forms an adjustable stop for the moveable core when it rises to open the valve. The gas ascends four grooves in the sides of the fixed core to a chamber F, in the bottom of which are fixed tubes, which pass up through somewhat larger holes in the cover, so that around each tube there is an annular outlet from the chamber F to a chamber G containing a fan H, from which chamber two passages K

conduct the mixture of gas and air to the passage I, terminating in a wire-gauze outlet Q, under the incandescence mantle J.

The electric motor comprises a permanent magnet L fixed on the fan chamber G, and having pole-faces, between which revolves the armature M, which is fixed on the axis of the fan. Two insulated brushes supply current to the commutator.

On putting the apparatus in circuit with a suitable source of electricity, the moveable core in D is attracted upwards, opening the valve, and causing the fan to revolve. The gas, as it ascends to the fan chamber, draws in air; and thorough mixture being made by the fan, the mixed gas and air pass up to the burner.

Instead of ascending by the passages K, the mixed gas and air may pass through a chamber X (fig. 3) to the burner.

For kindling the burner, a solenoid N may be provided connected to one terminal of the source of electricity.

Coin-Freed Gas-Meters. – Lake, H. H.; communicated from L. Haas, of Mainz, Germany. No. 7660; April 16, 1895.

This invention in coin-freed gas-meters is based upon the principle that an inserted coin acts as an abutment for mechanism actuated by weight or spring power; the coin being carried to its point of action either by its own weight or under an additional pressure. The mechanism actuated by weight or spring power is, when no coin is present, forced into that position which causes the closing of the gas conduit; and, on the other hand, when a coin is inserted, the mechanism is, under pressure exerted upon the coin—which pressure may also force the coin to its point of action—moved into the opening position. The time during which the coin remains at the point of action is so fixed that the coin is supported by a moveable member connected to the counting mechanism of the meter—the moveable member either carrying the coin gradually away as the counting mechanism advances, or causing the coin to drop after a certain time elapses.

Two constructional forms of the invention are described in the specification, which differ from one another in the means by which the coin is held in position, as well as in the means by which the pressure is exerted upon the coin. This automatic device is especially suitable for the direct actuating of the gas valves or cocks, because it operates under direct weight-pressure, and because the coin does not act by its weight, but is used as a resistible intermediate piece, which during its operation forms part of the apparatus.

The coin dropped through a slot of the slide-casing into a slide is, by pulling a handle of the slide, carried over the coin-channel, provided with openings for inspection; and it falls into a channel, which may be charged with a certain number of coins. By means of a pin fixed laterally to the slide, the lever (having a weight) is simultaneously turned upward on its pivot to such an extent that the coin inserted is enabled to fall in front of the lower striking-surface of the lever, and to present itself opposite the lower extremity of the channel. The coin thereby also arrives opposite the lower striking-surface of the valve-lever, which is in the position corresponding to the closure of the valve. By releasing the handle, the weight falls so that the lever will, by the aid of the coin, turn the lever and open the valve. During this movement, the lever presses the coin downward completely into the rounded striking-surface of the lever, and against a pin of a disc turned by the counting mechanism of the meter, and which pin now serves as a lower support for the coin. As soon as the pin slides from below the coin, the latter will drop down and the valve-lever be free to fall.

To ensure the falling down of the coin at a given moment, the following arrangement is made, which serves at the same time to prevent any further coins that may be stored in the coin-channel from dropping away unintentionally: At the periphery of the disc, the pins are arranged at uniform distances apart, in such a manner as to strike against the lower end of the valve-lever, and to finally turn the lever aside owing to the movement of the disc; thus still further lifting the valve, without, however, increasing or decreasing the delivery of gas. The coin follows this return movement of the lever until it finds, besides the pin which forms the first point of support, a second point of support by a pin fixed to the casing—the latter pin projecting over the periphery of the disc. As soon as the pin on the disc has approached the pin in the casing to a sufficient extent, the coin turning to the left hand drops down, and gradually takes up a position by sliding down along a fixed guide, and is finally (on the further turning movement of the wheel) thrown out.

When falling down from the pins on the disc and the pin in the casing, the coin drops first between one of the former pins and the upper edge of the fixed guide, so that the coin, when in this position, can serve as a support for any other coins that may follow, and is not removed from its position until the adjacent pin on the disc has passed by the lower edge of the lever, and this latter has fallen back, and thereby caught hold of the next following coin between itself and a projection.

Whereas in this gas-meter the valve is initially opened by the pressure transferred from the coin, at the end of the one period the counting mechanism itself will effect the holding of the valve in the open position, in order to thus liberate the coin from pressure, and allow of the free passage of the next coin. This free passage would not be possible if the coin were to force its way into its place. The forcing-in takes place in conformity with the construction in which the coin is passed from above to the point of operation, under a pressure sufficient to overcome the pressure of the valve-lever, to force the coin along the latter, and thus to open the valve.

The coin here slides through a channel downward, and arrives in the coin-channel after the plate (which closes the entrance opening of the channel by its own weight) has been raised thereby, so that the weight which is guided vertically, and which grips with a projection extending through a slot into the coin-channel, and underneath the plate, is lifted by the handle. The coin-channel may thus receive a certain number of coins, the lowermost of which, forced down by the weight, is pressed between the disc rotated by the counting mechanism on the one hand, and the extremity of the valve-lever on the other.

The disc is provided with pins fixed at smaller distances than the diameter of the coin used, and of such dimensions that the penetration of the coin effects in every position of the disc a sufficient return motion of the lever for producing an entire opening of the valve, and so that coins of too small a diameter are dropped. During the rotation, each coin slides between two pins of the disc, is passed round therewith, and is finally withdrawn from underneath the lever, which latter then places itself immediately against the next coin.

Valve-Gear for Gas-Generators.—Cutler, S., of Millwall. No. 10,224; May 23, 1895.

These improvements relate to the manipulation of the valves controlling the outlets of water-gas generators, where it is usual to pass the steam sometimes upwards, and at other times downwards, through the fuel. To accomplish this, gas-outlets are provided at both the top and bottom of the generator controlled by valves; and it is to a novel way of operating these valves that the invention particularly refers.

The valves employed are of the "outside rack-and-pinion" type, in which the sluice is raised by rotating, by means of the hand-wheel, a pinion geared into a rack attached to the head of the sluice. On an extension of the pinion-shaft is placed a mitre-wheel (or other suitable gear), which engages similar gear upon a vertical shaft. This vertical shaft may be continuous and directly coupled, or may sometimes more conveniently be made in two portions geared together with spur-wheels. In this manner the two valves are opened and closed simultaneously, as will be readily understood.

When the sluices of the valves are of different weights, a weight is placed upon the lighter valve, or the heavier valve is counterweighted by a suspended weight connected to the head of the sluice. The requisite travel for sluice-valves of different sizes is obtained by making either the racks, mitre-wheels, or spur-wheels of a correspondingly variable pitch or diameter.

APPLICATIONS FOR LETTERS PATENT.

18,719.—Exley, J. H., "Generating acetylene gas." Oct. 7.

18,815.—Hawkyard, J., and Braddock, J., "Prepayment gas-meters." Oct. 8.

18,824.—Kaestner, C., "Automatic gas-generating acetylene lamp." Oct. 8.

18,877.—Dvorkovitz, P., "Means or apparatus for distilling; applicable also for enriching gases by hydrocarbons." Oct. 8.

18,890.—Readman, J. B., "Obtaining cyanides." Oct. 9.

18,899.—Gardner, L., "Gas-engines—a device for reducing the compression while starting." Oct. 9.

18,908.—Lanchester, F. W., "Gas and oil motor engines." Oct. 9.

18,931.—Webber, W., "Prepayment apparatus for attachment to gas, electricity, or other fluid meters." Oct. 9.

18,933.—Eydman, F. H., "Bunsen burners applicable for heating and lighting, but more especially in connection with incandescent gas-lamp devices." Oct. 9.

18,940.—Höltje, F., "Automatically regulating the flow of liquids." Oct. 9.

18,945.—Lönholdt, F., "Gas heating and cooking apparatus." Oct. 9.

18,963.—Paget, A., "Manufacture or treatment of incandescence hoods or mantles for gas and other burners." Oct. 9.

18,964.—Paget, A., "Glass chimneys for gas and other lamps." Oct. 9.

18,965.—Paget, A., "Incandescence bodies or hoods for illuminating purposes." Oct. 9.

18,966.—Edwards, F., "Utilizing radiant heat." Oct. 9.

18,995—Southall, J., "Operating the valves of gas and oil engines." Oct. 10.

19,032.—Kindermann, P., Blumenthal, J., and Walch, F., "Incandescent lamps for burning gasified paraffin, volatile hydrocarbons, and the like." Oct. 10.

19,037.—Wolf, T. A. de, "Disposal of refuse and the like, and manufacture of gas." Oct. 10.

19,046.—Schneller, L., "Gas-engines." Oct. 10.

19,049.—Webber, W., "Prepayment fluid-meters." Oct. 10.

19,102.—Barrett, W. G., "Incandescent gas-burners." Oct. 11.

19,110.—Bowman, G. F., "Gas and oil stoves applicable for heating and ventilating purposes." Oct. 11.

19,138.—Vogel, J. L. F., "Alkaline cyanides." Oct. 11.

19,142.—Grove, J., "Oil or gas engines." Oct. 11.

19,183.—Shillito, T. R., "Automatically regulating the mixture of gas and air for incandescent gas lighting and for heating purposes, and for suppressing the noise made by the inrush of air when incandescent gas-lights are turned low." A communication from C. M. Römpler and H. Axmann. Oct 12.

19,197.—Webber, W., "Prepayment gas-meters." Oct. 12.

19,201.—Downing, G. C., "Manufacture of alkaline cyanides, ferrocyanides, and their derivatives." A communication from J. R. Moïse. Oct. 12.

19,202.—Crocker, S. H., "Mantles for incandescent light." Oct. 12.

Street Lighting in Liverpool.—The Special Lighting Committee of the Liverpool Corporation have decided that the lowering of the gas in the street-lamps on moonlight evenings between Oct. 15 and March 1 should be discontinued.

Ceara Gas Company, Limited.—The Directors of this Company report that the rental for private lighting for the year ending June 30 last shows a large increase over 1894; and, but for the low rate of exchange ruling during the past year, the result would have been most satisfactory. The profit is £3413, which, added to the balance brought forward (£666), gives a total of £4079. Deducting the interim dividend paid in April last (£1611), there remains £2468 available for division. The Directors recommend the payment of a dividend for the six months of 5 per cent. on the preference shares (less tax) and of 4 per cent. on the ordinary shares (tax free), together £1911; making, with the interim dividend already paid, 10 per cent. on the preference shares and 7 per cent. on the ordinary shares for the year. The balance carried forward will be £557. The Directors mention that the whole of the debentures (£7500) offered to the shareholders in June were applied for.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Oil-Gas Experiments at Bradford.

SIR,—Mr. Wright's personal attacks upon me in your last two issues demand a reply. I must emphatically protest against the way in which he alters and misquotes our reports and statements. Repeatedly, in his letters, Mr. Wright charges us with statements which we have never made, so that he may contradict them.

On p. 737, col. 2, line 72 of the JOURNAL, Mr. Wright states "Dr. Dvorkovitz had not adopted the candles used by Mr. C. Wood;" but on p. 740, col. 1, line 6, he contradicts this by stating: "I do not remember that Mr. Wood ever calculated his costs at per candle." On p. 783, col. 1, line 91, Mr. Wright speaks of taking me "literally," and of "calculating the costs in thousand candles," &c. Mr. Wright knows that I never calculated costs in "candles" or "thousand candles." Why will he still try to obscure his blunder by these oft-repeated contradictions?

On p. 738, col. 1, line 63, Mr. Wright deliberately misquotes our estimate of 0·42d. per *candle thousand* (see p. 680, line 4), which he alters to 0·42d. per *thousand candles*. We never gave any estimate of 0·42d. per "thousand candles" or per "thousand foot-candles." On p. 738, col. 1, line 68, Mr. Wright says: "If, however, he insists that I do take him literally, then his costs must be inevitably multiplied five times." Therefore taking Mr. Wright "literally," on Oct. 2 he still affirms that our estimate of 0·42d. per *candle thousand* should be multiplied five times!

On p. 739, col. 1, line 85, Mr. Wright says: "Mr. Charles Wood insists, and has always insisted, on the very high values for this oil-gas tar." This is untrue; and I challenge Mr. Wright to give a single instance where I have "insisted" upon any enriching value for them. Again, on p. 738, col. 2, line 5, Mr. Wright says: "If Mr. Wood feels that he must still insist upon his ability to extract 350,000 feet-candles from a gallon of oil, . . . (*vide* report of March 28)," &c. I have never *insisted* upon, or even mentioned, 350,000 feet-candles, or ever claimed that the whole bulk of the tar is worth 35,000 candles per gallon. Mr. Wright knows very well that the report of March 28, which he professes to quote, does not claim for the bye-products 350,000, or even 350, candles per gallon. In our report of Jan. 23, we said that some of the preliminary tests of the bye-products indicated 35,000 foot-candles per gallon. But we added that "it is necessary to experiment much further with them before we can even approximately say what their enriching value will be," and that "it is necessary to make tests of several weeks', or even months', duration to thoroughly determine the value of the process, and especially of the bye-products obtained in working it." (See JOURNAL, Vol. LXV., p. 329.) Since Jan. 23, we have simply taken the bye-products at the prices offered to the Corporation for them, without mentioning any enriching values.

Mr. Wright's quotation on p. 738, col. 2, line 43, that "Mr. Wood asserts that, out of 500,000 tons [of cannel] offered, none came up to my estimate of 23 candles, at the price I take of 13s. per ton." This is another case of misrepresentation. (See my letter, p. 542.) Mr. Wright knows very well that all his quotations of the illuminating power of gas refer to experiments at the Thornton Road works, and have no bearing whatever upon the quality of gas made from superior coal at the other works. The absurdity of Mr. Wright's cannel enrichment calculations we have already sufficiently exposed in our previous letter. Mr. Wright's remarks upon the evidence of the 33 days' test prove nothing, as the conditions of working in February and July were quite different. I agree with Mr. Wright that "a little goodwill would have explained the affair;" and I only regret that he did not show some of it at the right time.

I am sorry that Mr. Wright does *not* "put the affair of the calculations in its true light." His version of the circumstances under which my letters were sent on April 5 is untrue. No "orders" (as Mr. Wright politely puts it) were given to me by the Committee; but my suggestion that I should write for an explanation was agreed to. In his anxiety to excuse himself, Mr. Wright complains of the way in which I addressed him. Did he think, after he had made a silly blunder, which led some members of the Gas Committee to charge me with falsifying the report, that I must wait for the orders of the Committee, or anyone else, before asking him to correct his mistake? Did he expect to shield himself behind this flimsy excuse of privacy? Mr. Wright overreaches himself. I have sent you his letters of April 6 and 13; and as all the correspondence between us is now published, I will leave your readers to draw their own conclusions.

It will be seen that, in his letter dated April 1, Mr. Wright, in replying to the second query, says that 0·42d. per *candle-thousand* is "incorrect," and that 8⅓ farthings per candle-thousand is "correct." It will also be seen that, in dividing by 5 in each case, Mr. Wright also is a "man who has taken 1000 feet-candles and candle-thousand as equivalent terms." In a private report to the Committee, we were quite justified in using the terms "foot-candles" and "candle-thousand" in the sense that the members understood them; but Mr. Wright's use of these terms, with a different meaning, only misled them. I now think that he did not then understand the meaning of a "candle-thousand." He succeeded in deluding for a time members of our Committee; but does he suppose that gas engineers and your other readers are "so dense as not to see through that rubbish"?

On p. 738, col. 1, line 83, Mr. Wright complains that our estimate of March 28 did not include an offer made for the bye-products *five months later!* The concluding paragraph of Mr. Wright's letter of Oct. 9 is absolutely untrue.

Mr. Wright's letter of April 13, which purports to be a reply to mine of April 5, *I now see for the first time.* This letter is such a palpable evasion of the question in dispute—viz., the value per candle-thousand (see my letter of April 5, on p. 784)—that I will not discuss it except to point out his unwarranted assumption that "a *candle* is the light given by the burning of 120 grains of sperm." After committing himself to this statement, no one will be surprised that Mr. Wright "declines to discuss candles" with me. Such is Mr. Wright's method of "discussing"!

As Mr. Frank Wright now publishes a portion of his letter of April 2 (see JOURNAL for Oct. 8, p. 734), I must briefly refer to it. Why does he not publish his statement about our estimate of 0·42d. *per candle-thousand?* In a report dated April 9, sent in reply to my letter of April 5, Mr. Frank Wright says: "I have carefully perused the pamphlets issued on the 23rd of January and the 28th of March" (our reports on the experiments). He then gives long quotations from these reports, in which he coolly substitutes "*thousand candles*" for *candle-thousand* in our estimate of 0·42d. He concludes thus:

> In seeking to make both ends meet, by disregarding this most essential factor due to the consumption of gas taken as the standard for comparison with the photometer tests, Mr. Wood is not bettering his case, as he pleads most unwonted ignorance on a subject that every gas manager should be thoroughly at home with. Mr. Wood further asks my definition of a candle-thousand unit. I reply: The light equivalent to 1000 standard sperm candles, each consuming at the rate of 120 grains of spermaceti for an hour. *It is apparent that it will take a "candle-thousand" or 1000 "foot-candles" to enrich every 1000 cubic feet to the extent of a candle; and, upon Mr. Wood's figures, we arrive at the basis of cost at 2·1 pence.*

The italics are mine; and I would specially emphasize this sentence. No wonder the Committee were misled by such an astounding blunder.

It will now be seen, I think, that I do not "stand alone as the man who has taken 1000 feet-candles and candle-thousand as equivalent terms," but have the support of Mr. Frank Wright in the sentence just quoted, and the support of Mr. Lewis T. Wright in his letter dated April 1. (See JOURNAL for Oct. 15, p. 784.)

Mr. L. T. Wright's reference to pp. 50-51 of Mr. Newbigging's "Handbook" is characteristic. There is not a single word on these pages about foot-candles or candle-thousands.

Mr. Wright infers that I "mistake generosity for a blunder." I could substitute another word for "blunder;" but it would not be "generosity." Mr. Wright's "generosity" is on a par with his anxiety to avoid references to the calculations when he came to Bradford in July. When he did find that his and Mr. F. Wright's statements had led the Committee to believe that our estimate per candle-thousand was five times too low, why did he not honourably correct his mistake? Why did he not adhere to his first use of the term "candle-thousands," instead of *generously* "taking them per 200 candles, or cost of enriching 1000 cubic feet by 1 candle per 5 cubic feet"?

Was it "generosity" that prompted Mr. Wright to tell the Committee (see JOURNAL, p. 593, col. 1, line 75): "I have nothing to withdraw; but allow me to explain. If you take this paragraph literally, as it was presented to the Committee, Mr. Wood is five times wrong; but to let Mr. Wood down gently, I am willing to believe that Mr. Wood did not intend to convey the impression he did convey." Mr. Wright knew very well that the impression I "intended to convey," and *did convey*, to every member of the Gas Committee was, that the cost was 0·42d. per candle-thousand, or per candle of enrichment per 1000 cubic feet.

Bradford, Oct. 17, 1895. CHAS. WOOD.

SIR,—The conversion by Mr. Wood, in his letter of the 2nd of October (*ante*, p. 733), of the words of my letter to him of the 13th of April, 1895 (*ante*, p. 783), "If your Committee, or any member of the same, have thought that 'A's' answer to the second query brought out the candles five times too high, and the cost five times too low," into "if the Committee thought the cost per candle-thousand was brought out five times too low," is a serious misquotation, employed as it is in support of his unfounded contention that I was privately discussing a report of his, and that I had to go to a former one to find his use of the term 1000 foot-candles. The correspondence clearly shows that I was not discussing any report of his, but a letter that asks for the cost per 1000 foot-candles under a difference of opinion between "A" and "B." In that letter, "A" takes 1000 foot-candles as the product of 1000 cubic feet by 1 candle of illuminating power, which is stated (as almost everyone knows, and as "B" knew) in candles per 5 cubic feet; and further "A" treats a candle-thousand as the equivalent of 1000 foot-candles. "B" takes the same product, when divided by five, as representing those units. I have already shown that Mr. C. Wood, in his very first letter to me of the 5th of April (*ante*, p. 784), has made that admission.

The attitude of Messrs. Newbigging—who, after being associated with me in a perfectly friendly and cordial manner, go outside the matter on which they are engaged to report, and without notice to me, in order to give currency to a wretched story devoid of foundation; who, when it appears probable that I have a reply, deprecate the use of personalities, while making most liberal use of that poor weapon themselves; and who, when asked to explain a few of their own contradictory statements, excuse themselves on the score of not wishing to tire readers—is one that I shall not characterize, as I do not desire to deprive them of their monopoly in the use of personalities. To make an ill-founded complaint against anyone is, I suppose, a way of amusing readers; to have it refuted is to tire them.

1, *Victoria Street, S.W., Oct.* 18, 1895. LEWIS T. WRIGHT.

A Gas Company's Investment and Extensions.—An application was made, on behalf of the Tamworth Gas Company, at the Borough Court, last Wednesday, for a certificate to enable the Directors to use £445 which had been invested in Consols, with the accruing dividends, in payment for recent extensions. The application was granted.

Stratford-on-Avon Corporation Gas Committee.—Last Wednesday, a Local Government Board inquiry was held by Mr. E. P. Burd relative to an application by the Corporation for a Provisional Order to alter the Borough Act of 1879, so as to remove the limits imposed upon the amounts which might be paid for the purchase or redemption of gas annuities issued under the Act. The Town Clerk (Mr. R. Lunn) explained that the application was to the effect that the limit of 25 years should be struck out, and that the Corporation should have liberty to purchase the annuities upon any terms which they might think to the advantage of the ratepayers. There was no opposition.

LEGAL INTELLIGENCE.

Charge of Attempting to Steal Gas.

At the County of London Sessions last Tuesday, before Sir P. H. Edlin, Q.C., Roger Weeks pleaded "Guilty" to an indictment for having attempted to steal gas, the property of the Wandsworth and Putney Gas Company (*see ante*, p. 639). Mr. Besley, Q.C. (with him Mr. Layman), for the Company, said there was a second indictment, which charged the accused with having actually stolen gas; but he would not go on with that. Defendant lived in Earlsfield Road, Wandsworth, and it was found that a pipe had been connected to the main, so that gas could be used without passing through the meter. The Company had prosecuted as a warning to others, not with any desire that the man should be sent to prison. Mr. Drake, for defendant, said it had been stated that there was a falling off in the consumption of gas on the premises; but this was accounted for by the circumstances that Weeks formerly had in the house an office he had now ceased to use, having retired from business, and that the pipes were frozen last winter, and for some time the gas could not be burnt. Defendant was a retired builder, and bore a very high character. He was sentenced to pay a fine of £15.

A Water Company's Supply Used for Irrigation.

At the Tunstall Stipendiary's Court last Thursday, Joseph Colclough, farmer, of Ravenscliffe, was summoned at the instance of the Staffordshire Potteries Water Company for wilfully and negligently allowing water belonging to the Company to be wasted on Oct. 2. The case for the prosecution was that, at one o'clock in the morning of the day mentioned, an inspector tested the mains at Goldenhill, and found a great waste of water. He traced the course of the flow to the defendant's farm, where he discovered that the water was running from two taps into a broken tub and an iron cistern. The water was conveyed by a broken piece of spouting to the tubs, which emptied into a sewer, and apparently went to waste. The sewer, however, went a distance of 20 yards only; and at the end of it was a gutter, from which trenches were dug to various parts of the field. The water from the taps was running down those channels, and irrigating the field. The rate at which the water was running was upwards of 100 gallons an hour. On behalf of defendant, it was stated that the taps were not running when he went to bed. The Stipendiary pointed out that it was rather curious that the drain from the taps should run into the field in the way it did. He fined defendant 40s. and costs—£3 16s. in all.

The Toronto Gas Consumers' Company and their Reserve.

In May last, a special case was stated before Mr. Justice Ferguson, at Osgoode Hall, Toronto, bearing upon the proceedings of the Toronto Consumers' Gas Company in regard to their reserve fund. The plaintiffs were Mr. J. T. Johnston and the Toronto Type Foundry Company; and they sued on behalf of themselves and the other consumers of gas in the city. The following is an outline of the case, as given recently in the *Toronto Empire*: The defendants were incorporated in 1848. In 1887, being desirous of increasing their capital stock, they presented a petition to the Legislative Assembly of Ontario for authority to do so; and thereupon an Act was passed in that year, entitled "An Act further to Extend the Powers of the Consumers' Gas Company of Toronto," which came into force on the 23rd of April, 1887. It was alleged by the plaintiffs that, at the time of the passing of this Act, the defendants had a surplus of profits on hand, which was to have formed the nucleus of the "rest," or reserve fund, which at that time amounted to $394,310. The plaintiffs alleged that the defendants then sold the increased capital stock at a premium, and thereby realized a large sum, which, as they urged, should have been added to the reserve fund, and invested in some one or more of the securities mentioned in the 4th section of the Act; but, instead of so investing it, the defendants spent it for plant and material. The plaintiffs also charged that the defendants made large profits in their business since 1887, amounting to about $250,000, which should have been applied in forming the special surplus account to be used in the reduction of the price of gas to the plaintiffs, and also that the interest which would have been gained if the reserve fund had been invested should also have been applied in reducing the price. The plaintiffs also alleged a further sale of new stock by the defendants in October, 1893, which realized a premium of $83,040, which sum the defendants, as the plaintiffs feared, would, unless enjoined, use in the purchase and construction of plant, as also such fresh profit as might accrue from time to time. The plaintiffs claimed a return of sums which they said had been overpaid by them to the defendants as the price of gas consumed; and they asked for an account of the receipts and disbursements of the defendants since March 23, 1887, a mandatory order directing the defendants to comply with the provisions of the Act of 1887, a declaration of right, a declaration that the defendants were trustees, &c., and an order restraining them from misapplying the $83,040. The Company, by their defence, raised the question of the proper construction of the statutes relating to their reserve fund, &c., and they said they had reduced the price of gas. They also demurred to the statement of claim on the grounds that the plaintiffs had no *locus standi* to bring the action. The first question put to the Court was whether the plaintiffs had a right to maintain the action as constituted. This was answered in the affirmative. The second was whether the defendants were obliged to include in the reserve fund which the Act of 1887 directed them to have—(1) The moneys which they had standing to the credit of the profit and loss account, (2) to the credit of the contingent account at the time of the passing thereof, and (3) all the money received from the premiums on the sale of stock authorized by the Act to be sold until the fund amounted to 50 per cent. of the paid-up capital. The answer of the Court to this question was also in the affirmative. The third question was whether it was *ultra vires* on the part of the Company to invest or use the reserve fund, or any portion of it, in the purchase or construction of their plant or buildings, or in their business generally. The Court said it was. Then, was it *ultra vires* of the Company to invest the premiums on the sale of stock, or any part thereof, in the erection of buildings until the reserve fund had been found equal to one-half of the paid-up capital? This was answered in the affirmative. The reply to the fifth question—Did the defendants establish, maintain, invest, and use the reserve fund in accordance with the provisions of the Act?—was answered in the negative. No answer was necessary to the sixth question. The seventh question was: Has the plant and buildings renewal fund ever been created or maintained within the meaning of the Act? The answer was: It does not appear that this fund has been created or maintained as required by the 6th section of the Act. The next questions were After providing for all usual and ordinary repairs and renewals, was it *ultra vires* of the Company to invest or use the surplus of the plant and buildings renewal fund in their general business, or was the fund to be kept separate from the other moneys of the Company uninvested? If the usual and ordinary repairs and renewals did not amount to as much as the 5 per cent. referred to in the Act, should the full 5 per cent. be carried to the credit of the plant and buildings renewal fund, or only sufficient to cover the usual and ordinary repairs? These questions were answered as follows: There is no objection to the investment of any portion of this fund, remaining unemployed, in such securities as would be readily available in case the funds should be required; but there is no obligation resting upon the Company so to invest. The final question was whether, in addition to keeping the plant and buildings in repair by means of this fund, the Company had the right to write off sums of money from profits by "depreciation in plant?" The answer was in the negative. The judgment was therefore in favour of the plaintiffs; and it directed the taking of several accounts, comprehending the whole business of the defendants done since the passing of the Act of 1887, and including the surplus profits then in their hands. For the purpose of taking these accounts, a reference was directed to the Master-in-Ordinary. The plaintiffs are to be paid their costs to the present time by the defendants. Further directions and subsequent costs are reserved. The Company intend to appeal.

Horse v. Steam Traction for Conveying Coal to Gas-Works.—During a Local Government Board inquiry at Maidstone last Wednesday, in respect of certain proposed new regulations for traction-engine traffic in the county of Kent, the National Traction-Engine Owners' and Users' Association strongly protested against the alterations contemplated, on the ground that the industry would be so seriously crippled as to threaten its destruction altogether; while it would especially act against many of the gas companies who had their coal conveyed to the works by means of traction-engines. Mr. W. Arnold, one of the witnesses, said he might cite the Ticehurst Gas-Works as an illustration. The carriage of coals to these works by traction-engines, as compared with horse cartage, resulted in a saving of from 3s. 6d. to 4s. a ton. The Inspector said this seemed a very important statement. He was assured that it was correct, and that the difference would be more in some places; but if the alterations in the regulations were sanctioned, the traffic could not be carried on in many districts.

Gas Affairs at Stoke-on-Trent.—The Executive Gas Committee reported to the Stoke-on-Trent Town Council last Thursday that they had ordered a remittance of £890 to the Council; making a total of £2890 paid over out of the year's profits towards the reduction of the rates. They recommended that two purifiers should be put down at the gas-works, according to plans and specifications prepared by the Manager. In moving the adoption of the report, Mr. Geen, the Chairman of the Committee, stated that the cost of the purifiers would be from £800 to £1000, and that they would be paid for out of revenue. The report was adopted. In accordance with notice, Alderman Boulton moved an instruction to the Gas Committee to consider the advisability or otherwise of reducing the price of gas. In seconding, Mr. Greatbach said that the Stoke consumers were paying 25 per cent. more for their gas than their neighbours; and the Corporation were paying 13s. per lamp more for public lighting than Hanley. Mr. Geen proposed, as an amendment, that it be an instruction to the Committee not to reduce the price of gas until they were satisfied that the annual profits from the undertaking were sufficient to enable them to pay the Council 5 per cent. upon the amount of capital employed. The amendment was carried by 18 votes to 2.

Serious Accident to a Warehouse and Gas-Mains at Halifax.—An extraordinary accident occurred at Halifax last Wednesday evening. At the corner of Horton Street and Church Street stands a large warehouse, four storeys high, with a frontage of some 80 yards to Church Street. Overhanging the building was a massive cornice and parapet; and a few minutes after six o'clock, the portion in Church Street, from one end of the building to the other, fell with a tremendous crash, completely covering the whole thoroughfare. A horse and brougham, with the coachman (William Holroyd), were standing beneath. Holroyd's head was crushed in, and death was instantaneous; the horse was killed; and the brougham was completely smashed. Soon after the accident, a strong smell of gas was perceived in the street; and workmen from the gas-works concluded that the vibration caused by the heavy fall of masonry had damaged the mains, and caused the gas to escape. It was therefore considered dangerous to move about with lights, for fear the quickly accumulating gas should explode. Several times it did ignite; and some difficulty was experienced in extinguishing the flames. The gas continued to accumulate in Church Street; and the police requested the tenants of the three adjoining houses to leave their dwellings, lest an explosion should occur. The tenants acted upon the advice; and the wisdom of this step was apparent later in the evening, for the gas in one of the houses exploded with a loud report, and the kitchen in the basement was soon in flames. The fire brigade were summoned; and they prevented the flames from spreading to the adjoining property, and ultimately extinguished them.

MISCELLANEOUS NEWS.

THE GAS QUESTION IN LIVERPOOL.

The Special Lighting Committee's Memorandum—Newspaper Correspondence.

The controversy which has been going on in Liverpool in regard to the price and quality of gas—resulting, as already recorded in our columns, in the passing by the City Council of a resolution to take steps to "establish and maintain a competitive gas supply," and in the Town Clerk being instructed to retain the services of "an eminent gas engineer in London" to report upon the matter—has given rise to some newspaper correspondence which it may be of interest to reproduce, in conjunction with other documents bearing upon the question.

It will be remembered that, towards the end of last month, a report was presented to the Special Lighting Committee of the Council, by the Gas Examiner (Mr. C. R. Bellamy), giving the results of tests he had made of the illuminating power of gas in various towns. It was preceded by a memorandum, signed by the Chairman of the Committee (Mr. F. Smith), recording the circumstances which led to the making of the tests. It appears that at a meeting of the Committee and a deputation from the Directors of the Gas Company, which took place on the 28th of June last, the Directors demurred to accept as reliable the value ascribed to gas in other towns, as shown by official and parliamentary returns. As a consequence, no certain comparison could be made between the Liverpool gas and other gas, and discussed, until the respective values were definitely ascertained. The Committee accordingly authorized Mr. Bellamy to proceed to the various towns having the principal gas undertakings of the country, and test the illuminating power with the same instrument as is at present, and for the last twelve months has been, used for testing in Liverpool. The tests were made with three different burners; and they demonstrated to the members of the Committee who witnessed them that the use of a burner suitable to the gas is absolutely necessary before the consumer can ever hope to obtain anything like the best light for the money he expends. They found that the average loss of light due to the use of the ordinary fishtail burner amounted to about 34 per cent. Taking Liverpool, Glasgow, and Sheffield, as being capable of easy comparison, the following figures were given:—

Town.	Illuminating Power.	Price of Gas. s. d.	Cost of Coal per Ton. s. d.	Value of Residuals per Cent. on Cost of Coal.
Liverpool.	20·11 ..	3 4 / 3 0 ..	20 7·40 ..	32·04
Glasgow .	20·87 ..	2 6 ..	9 9·10 ..	45·62
Sheffield .	20·40 ..	1 10 / 2 5 ..	8 6·82 ..	101·15

It was explained that "the two prices of gas in Sheffield represent the maximum and minimum charges—the actual charge being according to a sliding-scale based upon the amount of gas consumed; while the two prices in Liverpool represent the charges for the first and second halves of 1894, or an average for the year of 3s. 2d., as compared with 2s. 5d., the highest charge in Sheffield, though the lighting value according to the actual test is practically identical in both towns." The Committee went on to point out that "the coal, &c., consumption for gas manufacture in Liverpool is over 300,000 tons per annum;" and they remarked that, "if Liverpool used material as cheap as that used by either Glasgow or Sheffield, the saving to the ratepayers who are gas consumers would be very great. A saving of £150,000 per annum on coal would represent a reduction of about 1s. per 1000 cubic feet to consumers of gas." The memorandum closed with an expression of the confident hope that attention rightly directed to this subject by the Council and the Directors of the Company would result in some action bringing about a very substantial reduction in the price of gas for both lighting and cooking purposes, "especially bearing in mind the large purchasing power of Liverpool, its close proximity to the Lancashire coal-fields, and the large number of important consumers." The first step in the direction of attaining the desired end was taken by the Corporation, who assumed the hostile attitude referred to in the opening paragraph of this article.

At a meeting of the Special Lighting Committee on Monday last week, the following letter, addressed to the Town Clerk (Mr. Harcourt E. Clare) by Mr. P. F. Garnett, the Secretary of the Gas Company, was read: "I am instructed by the Directors to inform you that, in accordance with my letter of the 26th ult., a thorough investigation has been made into the subject-matter of the Special Lighting Committee's memorandum of the 23rd of September, 1895, with the result that it has been found to contain many very erroneous and misleading statements, and that the comparisons drawn to the prejudice and disparagement of the Liverpool Gas Company are absolutely unfair and unwarranted. But inasmuch as the City Council has now assumed a distinctly hostile attitude, by passing a resolution to apply for statutory powers to establish and maintain a competitive gas supply, the Directors consider that the proper place for entering into details will be a Committee-room of the House of Parliament; and they regard with much satisfaction the prospect of having an opportunity to submit their whole administration of the Company's affairs to the impartial judgment of that tribunal. In view of the altered relative position of the Corporation and the Gas Company, the Directors feel that it would be useless to have any further interviews with the Lighting Committee." Though this communication was of great importance, it was not published; and the result was, as pointed out by a local newspaper, that adverse criticisms were made by parties who must have been aware of the true position, but who "carefully refrained from allowing the ratepayers to know the other side of the question as stated on behalf of the Gas Company."

In the paragraph on p. 774 last week, it was mentioned that a correspondent of one of the Liverpool papers advised the Corporation to acquire the Company's undertaking. The correspondent in question was Mr. G. H. Ball; and his letter (which appeared in the *Liverpool Courier*) was as follows: "Since I wrote the letter to the *Courier* of Feb. 21, 1894, *in re* the Corporation and the Gas Company, the shares of the Company and those of nearly all the other gas companies in the kingdom have gone up very much in value, owing to the fact that more recent experience has proved that the increased use of the electric light has had very little material influence upon the consumption of gas in all parts of the world. In many places—Paris, Vienna, Berlin, &c.—the improved gas-burners, with more brilliant and less costly light, have displaced the electric light to a great extent. As the chief grievance against the Gas Company by the Corporation is that of extravagant management, for which there may be some justification, there is a practical and easy remedy. Let the Corporation guarantee the shareholders the statutory dividends, and take over the Company's undertaking holus-bolus, as was done in Glasgow with great success. The management could then be done by a Committee of the Corporation open to public criticism, as is the case in Glasgow, Manchester, Leeds, and other towns. By obtaining a relaxation of the Act of Parliament, so as to enable the Corporation to reduce the minimum illuminating power from 20 candles, as it is at present, to 18 candles, which has been found in Leeds by testing to be sufficient for all practical purposes, a considerable reduction in the cost of production could be made; and I am quite satisfied that, under economical management, gas could be supplied at 2s. 3d. per 1000 cubic feet, or perhaps less, after paying dividends, &c."

The foregoing letter was answered by the Chairman of the Special Lighting Committee (Mr. F. Smith). The following are the principal portions of the reply: "Mr. Ball says that Paris, Vienna, and Berlin have improved burners that have displaced the electric light; and I cannot but think that, if the Gas Company here had done what they could, the Liverpool consumer would to-day have a burner which probably would save one-third of the gas bill while improving his light. Such a burner, certified by the Corporation test, will, it is hoped, be forthcoming. Everyone who has considered the matter will agree with Mr. Ball that, while electric lighting is most desirable in many cases, it is not sure to displace gas; and therefore it becomes necessary for Liverpool to have the right to supply gas, at any rate in the portions of the extended city as yet undeveloped. It would have been useful if Mr. Ball, from his wide Continental experience, had given us the terms upon which the gas undertakings of the places he names are carried on. It is said they manage these things better in France; and I understand that in Paris a very large sum is annually paid by the gas undertakers to the Municipality for their privileges, and that thereout the beautification of the city is largely made. This form of benefit is perhaps not the best; but it is infinitely better than nothing at all, and dear gas into the bargain. Mr. Ball, referring to Liverpool gas, says he is quite satisfied that, under economical management, gas could be supplied at 2s. 3d. per 1000 cubic feet, or perhaps less. I certainly think it is to be regretted that he did not propound and discuss this view at the last meeting of the Gas Company, or when the gas engineers of the kingdom held their meeting here. Mr. Ball, who for some years was a hard-working public man of experience, also suggests, as what he calls a practical and easy remedy, that the ratepayers of Liverpool should pay equivalent to £400 for each £100 ten per cent. share, though the market price to-day is 239 to 241. If this were the only remedy, sorry indeed would be the plight of the gas consumer. There is a much more drastic remedy in the hands of the people; and, wild and visionary as it may appear to-day, it does not portend greater changes than have been already accomplished in Liverpool. The attentive dealing with the subject is only in the bud; but, under the kindly and discreet, but firm, nurture of the ratepayers, it will, I trust, bring forth much fruit. I want to see hundreds of poorer homes in the city supplied with cheap coke, which should form an economical fuel; and, as they cannot afford electric light, gas on the best terms—say, at 1s. 6d. per 1000 cubic feet, and not, as at present, at 3s. 4d., cash in advance, while the richer neighbours pay 2s. 10d. at the end of the quarter. The friends of the Company say this is a party question; but the question is one the magnitude of which far exceeds any party question ever raised in our city."

Another correspondent—Mr. Thomas Scott—took up the question; commencing his letter as follows: "Account for it as we may, there seems no doubt at all that the average Englishman hates a monopoly. Only those who profit thereby can be found to say a word in its favour; and this is equally as true of the Liverpool gas monopoly as of any other. When a monopoly is of the nature that provides 10 per cent. per annum profit under all circumstances—that is, when the 10 per cent. is absolutely safe, no matter whether the business be ill or well done—it is one with which the owners may well be satisfied; and it is idle to expect that they will desire change. They are willing that it shall go on for ever. It has been urged that the 10 per cent. return is really a fallacy; but that I deny. Truly, anyone buying gas shares now would have to pay a price which would only leave 3 or 4 per cent. interest. That, however, is a matter between buyer and seller, and does not make the gas supply any cheaper to the public, who from first to last have paid 10 per cent. on the original stock; and if the buyer only gets a reduced interest, it is because he has thought it worth while to pay perhaps £250 for every £100 worth that he has bought. Then, also, most men think that a monopoly paying 10 per cent. dividend, and which has lasted fifty years, has lasted long enough at the expense of the public, even to satisfy those who undertook the original risk."

As this seemed to be the idea entertained by Mr. F. Smith, Mr. Ball made it the basis of his reply to both gentlemen. Thinking it would be interesting to the public to have a little information as to the real state of the case, Mr. Ball inquired into the early history of the Company, in order to make himself fully acquainted with all the facts. These he set forth as follows:—

"I find that originally there were two Gas Companies in Liverpool. One was called the Liverpool Gaslight Company, founded as far back as 1816. The stock at that time issued was nominally a 10 per cent. stock; but, as a matter of fact, the very first issue was sold at a premium. In 1845, the same Company sold £25,000 of 10 per cent. stock, which realized £45,344; and in 1848, they sold a further amount of £25,000 of 10 per cent. stock, which realized £40,163. On two occasions (1841 and 1846), for some reason, I presume, according to the Money Market at the time, they allotted some stock at par. Then in 1848 they amalgamated with the Liverpool Oil-Gas Company; and

from that time it has continued as the Liverpool United Gaslight Company. I find that even with the Liverpool Oil-Gas Company the great bulk of their shares were sold, and realized a very large premium. In 1834 and 1838, £70,000 of 10 per cent. stock realized a premium; in 1841 and 1843, £17,000 of 10 per cent. stock was sold for £24,345; and in 1844 to 1847, £40,000 of nominal 10 per cent. stock realized £73,677. In 1848, when these Companies were amalgamated, it was under an Act of Parliament, which contained certain obligations on the part of the Company, and certain privileges. The last Act in reference to the Company was passed in 1886; and from that time the Company have issued nominal stock at 7 per cent., but it must be sold by public auction, so as to realize the utmost capital that the public are prepared to invest at the price. But prior to that, even so far back as 1882, 7 per cent. stock was issued, known as 'B' stock, at a very large premium. For instance, in January, 1883, £75,000 nominal 7 per cent. stock was sold for £94,082; in 1884, £75,000 was sold for £98,341; in 1885, £50,000 of 7 per cent. stock was sold for £75,163; in 1888, £8100 of stock was sold for £12,414; and again in 1888, £41,900 of stock was sold for £64,214; in 1891, £38,100 of stock was sold for £55,253; in 1892, £50,000 of stock was sold for £75,040; in December, 1894 (the last sale that was made), £40,000 nominal 7 per cent. stock actually realized £67,647.

"The whole of these premiums I have quoted—the whole premiums paid upon these values—have not gone into the hands of any speculative shareholders or any individuals whatever, but have been used as capital in carrying on and extending the Company's undertaking; and the popular idea that the Company's shareholders are obtaining such large dividends as mentioned by Mr. Alderman Fred. Smith and his friend Mr. Thomas Scott is altogether erroneous, and evidently shows that these gentlemen either do not understand the question they are speaking and writing about, or it would seem they meant to mislead the public. What I wish the public to understand is this—that, upon the faith and strength of an English Act of Parliament, investors have been induced to pay such high prices as I have mentioned for their stock in the Company. The amount actually realized in dividends upon the whole of the capital stock is small as compared with the nominal dividends of 7 and 10 per cent. As a practical illustration of this, I mention the very last sale that took place—in December, 1894. The Company were then anxious to obtain £65,000 of capital to extend their new works. In order to obtain that sum, the Directors resolved to offer £40,000 nominal 7 per cent. stock by auction. It was sold in the Law Association Room, and realized £67,647, which, at 7 per cent. on the £40,000, will yield a dividend of £4 2s. 9d. per cent. to the shareholder upon his investment. Of course, no one in his senses would think of investing his money in an ordinary trading concern for such a low rate of interest, especially with the knowledge that, under any circumstances, whatever the amount of profits obtained by the Company, he was not allowed by Act of Parliament to receive more than £4 2s. 9d. per cent. upon his investments—the surplus profits must be used on the reduction of the price of gas. On the other hand, it would have been very foolish of him to invest for such a small interest unless he considered that, though he was not allowed to receive more than £4 2s. 9d., he was in some way protected against getting less than £4 2s. 9d. per cent. So the Act empowers the Company, in order to secure uniformity of dividends in accordance with this limitation, to raise, if necessary, the price of gas as high as 4s. 6d. per 1000 cubic feet as a maximum charge; and it is the limit of fluctuation between the price of 2s. 10d. at present and 4s. 6d. per 1000 feet that affords security to the investor for the permanence of his dividends. This has been explained over and over again by the Chairman of the Company at meetings. I have already explained it through the Press myself for some years past; but, notwithstanding this, the public are deluded by such statements as have been made by the gentlemen in question.

"Mr. F. Smith was pleased to refer to me in his letter as a large shareholder in the Company. I may as well inform Mr. Smith and the general public that the actual capital which I have in the Company, and which has gone to the Company, and not to any speculator, does not quite pay me 5 per cent. per annum; and at the last auction sale I offered as much as £168 per share, which would not have paid me £4 5s. per cent., and I was unable to get any. The gas consumers get the advantage of all this, for the simple reason that, had the Company not realized such a high price for their shares which brought them in the necessary capital, they would have had to have issued shares at a lower price, which would have necessitated the realization of a greater amount of profit to pay the statutory dividend, which profit would have had to be made up by raising the price of gas to the consumers. But owing to the favourable conditions upon which the Directors were able to dispose of their stock, the gas consumers get a considerable advantage in having the gas at a lower price. It is not my intention to defend the action or management of the Company's Directors. I have no doubt they will be able to give some explanation themselves as to the charges made against them by Mr. Smith and others. I am now simply speaking from a shareholder's point of view, in order that their interests may be safeguarded from any such insidious attacks as have been made.

"Reference has been made also as to the extravagance of the Company in connection with their works; and the question has been raised as to what the probable value of the whole of the Company's offices, works, and undertaking is as a going concern. From inquiries I have made as to the charge for renewals, enlargements, old plant, mains, &c., I am satisfied that if we were to start *de novo*—that is, supposing the Company did not exist, and that it was decided to put down plant, mains, and break up the streets for a new concern—it would cost considerably more than now stands in the capital account of the Company.

"In my recent letter, I mentioned that if the Corporation took over the whole of the Company as a going concern, and guaranteed the statutory dividends, which amount to the rates mentioned above, it would enable the Corporation to take over the concern without any outlay of capital at all more than has already been made. It simplifies the transaction, and would bring about a change in the mode of management, which I think at present is not sufficiently made public; and by the relaxation of the Act of Parliament which now fixes the minimum illuminating power at 20 candles, so as to enable the Corporation to reduce it to 18 candles, which in some other towns has proved satisfactory, the Corporation could supply gas at a much lower price. Moreover, if they thought it advisable to continue the working of the electric light, it would enable them to work under better conditions by a combination of departments, as in Glasgow and Manchester, and make it more economical and satisfactory to the public.

"As a practical illustration of Mr. Smith's inability to act as a guide to the public in these matters, I refer to his *ad captandum* remark 'that he wanted to see hundreds of poorer homes in the city supplied with cheap coke, which should form an economical fuel.' I think I need hardly remind you that the Gas Company is carried on chiefly to supply gas; and it is the duty of the Directors to obtain the best price for their residuals, in order to keep down the price of the gas to the public. It must be apparent to the simplest mind that the lower the price at which the Company sell their coke, tar, and ammonia, the higher the price it would be necessary to charge to the consumers for gas. If Mr. Smith thinks the terms I have suggested upon which the Corporation could take over the Company are not satisfactory, I may tell him for his information that the shareholders would no doubt be exceedingly pleased to sell upon the same terms, and at the same ratio of value to the net profits earned, as he considers he has so successfully arranged with the Electric Supply Company."

With regard to the "eminent gas engineer in London" alluded to in the opening paragraph of this article, more definite information was furnished by the following announcement in the *Liverpool Courier* last Wednesday: "The Finance Committee of the Liverpool Corporation have adopted a resolution authorizing the Town Clerk to give a general retainer to Mr. George Livesey, Gas Engineer, and to engage him, at a cost of not exceeding 100 guineas, to consider and report on some scheme to supply Liverpool with gas independently of the present Gas Company." Mr. Livesey replied to this statement as follows:—

The Editor of the *Liverpool Courier*. *Oct.* 18, 1895.

Sir,—The statement in your issue of the 16th inst. is quite correct so far as the offer by the Town Clerk of a retainer in this matter is concerned. I should, however, feel obliged if you would permit me to say that I replied, expressing my appreciation of the confidence of the Finance Committee of the Corporation; but that my connection with the South Metropolitan Gas Company was an absolute bar to my taking a hostile position towards any gas company. I could not, therefore, accept the retainer.

May I also be allowed to say that an independent gas supply is utterly out of the question? It is more than thirty years since Parliament sanctioned a competing gas company; and it has never authorized—and it is not at all likely that it ever will authorize—any corporation to introduce an independent supply in competition with a company. The best plan for dealing with the question will be for the Corporation to open friendly negotiations with the Gas Company, with a view to a reduction of the illuminating power of the gas. The present high quality costs the consumers more than it is worth. It is the cause of the high price paid for coal; and with a lower quality, at a correspondingly lower price of gas, the consumers would get better value for their money.

(Signed) GEORGE LIVESEY.

South Metropolitan Gas Company,
709A, Old Kent Road, S.E.

THE RIGHT OF GAS SHAREHOLDERS TO VOTE ON ELECTRICITY SUPPLY QUESTIONS.

The important point as to the disability of shareholders in gas companies taking part in the discussion of, or voting upon, the subject of the supply of electricity at meetings of urban district councils and kindred governing bodies, was a topic of much discussion at the meeting of the Reigate Town Council last week. Several electrical supply companies had given notice to the Council that it was their intention to apply to the Board of Trade for a Provisional Order to authorize them to furnish electric light within certain areas of the borough. A special meeting of the Council was accordingly held to determine whether a private company should be allowed to do the work, or whether the Corporation should apply for a Licence and carry out an installation. All went smoothly until Alderman F. Budgen, a Director of the Gas Company, rose to speak; when Mr. Viall asked the Town Clerk (Dr. Grece) to give his legal opinion as to whether a gas shareholder could take part in the discussion of, or vote upon, any motion relating to electric lighting. In reply, the Town Clerk read the opinion of Mr. G. Humphreys, of the Temple, which, he said, had appeared in the JOURNAL OF GAS LIGHTING for April 10, 1894, respecting a similar point which had been raised at the Monmouth Town Council. Many of our readers will doubtless recollect that Mr. Humphreys considered that members of the Town Council who were also shareholders in the Monmouth Gas and Water Company were not pecuniarily interested, either directly or indirectly, within the meaning of the Municipal Corporations Act, 1882. He (Mr. Humphreys) thought, therefore, that the Mayor of Monmouth was bound to treat them in all respects in the same way as the ordinary members of the Council; and that the fact that they were Directors of the Company did not preclude them from taking part in the discussion of, or from voting upon, the scheme for electric lighting. The Town Clerk, having read this extract, said his views entirely coincided with the opinion given by Mr. Humphreys; and the Mayor was about to rule that Alderman Budgen might speak, when Mr. Viall handed in an extract from an opinion of Mr. R. S. (now Mr. Justice) Wright in regard to electric lighting, which was cited in respect to a similar question raised at the Wells Town Council early last year. He also produced one of Sir R. E. Webster, Q.C., M.P. Mr. Justice Wright said:

The question turns on the construction of section 22, sub-section 3, of the Municipal Corporations Act, 1882. In my opinion, those members of the Council who are shareholders in the Gas Company have a direct pecuniary interest in the question whether or not the Council shall give their consent to the application by the Electric Light Company for a Licence under 45 & 46 Vict., cap. 56, sec. 3; and such members are not entitled to vote on the question, or to take part in the discussion of it. No penalty is

attached to a breach of section 22, sub-section 3; and all that can be done in order to prevent such members from voting will be to get some member of the Council to draw the attention of the Mayor to the facts that the votes in question ought not to be received, and will be invalid. (See Rule 10 of Schedule II. to the Municipal Corporations Act, 1882).

(Signed) R. S. WRIGHT.

The Town Clerk, having read the foregoing opinions, said he would not place his ruling in opposition to such authorities. Had he not seen Mr. Justice Wright's opinion, he should have accepted that of Mr. Humphreys—that a pecuniary interest had not been made out. After a good deal of discussion, in which, however, none of the gas shareholders took part, it was resolved that Counsel's opinion should be taken "as to the legality or otherwise of gas shareholders voting on the electrical supply question."

[This matter is dealt with in our editorial columns.—ED. J. G. L.]

THE DVORKOVITZ OIL-GAS CONTROVERSY AT BRADFORD.

As might have been anticipated, the "paper war" over this subject has not been allowed to die down all at once; and the Bradford local papers have contained further references to the matter. Among the contributions that need noticing here, is a reply by Mr. J. E. Gresty to the letter by Mr. W. W. Shaw, the substance of which appeared in last week's JOURNAL (p. 789).

After some introductory remarks, dealing mainly with his denial of the alleged infringement of the Peebles patents by the Huddersfield oxy-oil plant, Mr. Gresty gives further particulars as to his Company's (the Northern Counties Hydro-Oxygen Gas Company's) offer to the Bradford Corporation. Concerning this, he remarks: "The offer made by my Company was an alternative one. One was that my Company should construct a plant at their own expense, and take all risks; and that one-half of the saving thereby effected should belong to the Corporation, and the other half to my Company. It was proposed that this plant should be constructed at the Valley Road works; and, as previously explained, we estimated that one-half of the saving would be £1562 10s. per annum. I am prepared for present purposes to accept Mr. Shaw's statement that, if oxy-oil were adopted at the whole of the Bradford gas-works, the yearly saving to the Corporation would be £9375; and one-half would be £4687 10s. The intention was to apply it to one works only; and it is to be observed that the whole risk would be my Company's, who could only make a profit if it proved a success, as we had every confidence it would be. The Corporation would have been a great gainer without risk or cost. I am quite aware that, when it had proved a success, it is probable the Corporation would not deal with its other works on the half-profit system, but would fall back upon the alternative scheme of a royalty. It is clear that the division of profits cannot in any way be treated as a royalty for the purpose of comparing cost with the Dvorkovitz process; and for comparison we must deal with our alternative proposal. This was that we would put down a plant at our own cost; and if it proved successful, it should be taken over by the Bradford Corporation at cost, and be then subject to the payment of a royalty which, for enriching the whole output of the Bradford borough 2 candles, would not amount to more than £450 per annum. In making our calculation of profit, we had an ample margin not only for this royalty, but for interest on outlay upon plant, depreciation, and cost of oxygen; and we were satisfied the Bradford Corporation could rely upon at least a net profit which would, on Mr. Shaw's figures, amount to not less than £9375, if the whole output were enriched to the extent of 2 candles."

In comparing the oxy-oil and the Dvorkovitz processes, Mr. Gresty points out again that his statement was based upon a calculation from figures in Mr. Wood's report, which Mr. Shaw quoted in his letter of Sept. 20.* It is there stated that 55 tons 1 cwt. 3 qrs. of oil were used to enrich 41,125,000 cubic feet of gas to the extent of 2·16 candles. At the present time, the whole output of Bradford is above 1,600,000,000 cubic feet; so that, in the same proportion, 2095 tons of oil would be required to enrich the total output. The question is, says Mr. Gresty, in round numbers—Say 55 tons enrich 42,000,000 cubic feet of gas 2 candles, what will enrich 1,500,000,000 cubic feet? Is it not rather that Mr. Shaw relies on his imagination, and cannot, or dare not, realize what the facts are?

Concluding his letter, Mr. Gresty says: "I gather from Mr. Shaw's last letter that he has now reduced the value of the bye-products to 3¼d. per gallon. It is somewhat amusing to find out how the values of these bye-products have been reduced. Not very long ago I was told that Dr. Dvorkovitz said they were worth 1s. per gallon; after which they were stated to be worth 6d. per gallon; then they were reduced to 4d.; and now to 3⅛d. Possibly, in course of time they may come down to Mr. Wright's figure of 1·71d., which, I believe, is not very far from being correct. Mr. Shaw, in his letter, states that they are prepared to buy these products at 3¼d. per gallon; but Mr. Shaw does not detail the exact terms upon which he is prepared to purchase, nor for what length of time his contract will hold good. As Mr. Shaw must know, the attempt to which he refers, as having been made in Paris forty years ago, to mingle oxygen with gas, bore no similarity whatever to the oxy-oil process. He might with equal relevance have referred to the large numbers of oil processes which have been attempted before the Dvorkovitz process was thought of."

Water-Works for Castlebar.—Mr. C. P. Cotton, the Chief Engineering Inspector of the Local Government Board for Ireland, held an inquiry at Castlebar last week, with reference to an application by the Sanitary Authority for a loan of £8500, for the purpose of constructing water-works for the town. The proposed works contemplate the provision of 15 gallons of water per head per day for 4000 persons. The application was not opposed.

* See JOURNAL for Oct. 1, p. 681.

FLETCHER, RUSSELL, AND CO.'S NEW LONDON PREMISES.

It is a gratifying and promising feature in connection with the gas industry that the manufacturers of gas appliances for domestic purposes have, during the past few years, found it necessary, in order to cope with the constantly increasing demand for their goods, to extend their productive power, and provide additional room to display the growing variety of patterns they have to show their customers. It is not many years ago that the first-named partner in the firm of Messrs. Fletcher, Russell, and Co., Limited (whose works are at Warrington and Manchester), was contented with a small London establishment in Upper Thames Street; but, with the progress of time and business, three changes to larger premises have had to be made. The last move (which has recently taken place) is to 134, Queen Victoria Street. This is an extensive building at the corner of Peter's Hill; and it consists of four floors, each of an area of about 87 feet by 25 feet, with a basement of equal dimensions. Entering the ground floor, one is struck by the admirable disposition of the goods which has been effected by the Manager (Mr. C. Clare). On one side is placed a whole series of the firm's well-known cooking-ranges for ordinary use—from the large double oven down to the small "Savoy" oven, the height of which with burner and stand measures only 16½ inches. Among them is a specimen of the new "Kensington" range, which has been specially designed for use with prepayment meters, and which combines the essential qualities of being simple, strong, and easy to clean, with all parts interchangeable. Down the centre of the room are numerous gas-fires, of both old and new types. The latest productions of the firm in this particular line are the "Register" fires, which may be seen in operation. These fires contain improvements which will commend them very strongly to favour. In devising them, the firm have had an eye to the production of a fire which shall have the resemblance of an ordinary coal fire, with, of course, the absence of the surrounding dirt; and they have succeeded. In these new stoves, the canopy is raised above the top of the incandescent fuel, exposing the upper surface, and also the back of the fire; and so utilizing the additional direct radiant heat, and doing away with the objectionable "boxed-in" appearance of gas-fires as hitherto made. Another feature is the moveable fire-clay flap at the back, which is actuated like the flap of the ordinary register fire grate. On first lighting, when all is cold, a full free way is provided for the escape of the products of combustion; but as soon as the draught is established, it can be partially closed, reducing the outlet to the minimum required, and so obviating any waste of heat. The fires (which are fitted with non-lighting-back burners) are made in several styles, which all lend themselves to a variety of adornment suitable for any class of room. In the decoration of their fires, Messrs. Fletcher, Russell, and Co. have introduced a new idea in the use of their "Chimatto" porcelain enamel. Instead of the ordinary plain enamel, a very pretty effect is obtained by mottled colours. Some important improvements have also been achieved in the syphon and condensing types of gas-stove. On the same floor may be seen specimens of the smaller domestic gas appliances manufactured by the firm; and also a large assortment of their laboratory goods, including the new gas-furnaces (fitted with the powerful "Cyclone" burner) for workshop and trade processes. Many applications are now made for large kitchen apparatus for hospitals, infirmaries, hotels, and clubs; and descending into the basement stock room, some huge ranges, ovens, carving-tables, and hot closets for such institutions are on view. A section of the basement has been set apart for a kitchen; and this will shortly be fitted up with apparatus capable of cooking for 1000 people. Adjoining the kitchen, a bath is to be fixed with a water-heater in operation, and also a testing-table for laboratory goods. The first floor of the building has been assigned to the display of the handsome mantels and overmantels, with iron frames and tiled panels, for which the Manchester department of the firm is famed, and which are alike suitable for gas-fires or coal-grates. In connection with the adaptation of ordinary fireplaces for gas-fires, the firm have introduced a novel idea. Instead of the unsightly plain sheet of iron hitherto employed for filling in the opening in which the coal grate has been, they now affix artistically designed tiles to the plates; and this has a very pleasing effect. On the floor above will be found further examples of the firm's ironwork, including lavatories, with gas water-heaters; and the top floor is mainly utilized for storage. The whole building is most conveniently arranged for the purposes to which it is devoted; and it is well worth visiting.

GAS-WORKS IMPROVEMENTS AT FALKIRK.

The Starting of the Peebles Oil-Gas Plant.

Soon after the Falkirk Corporation Gas Commissioners acquired the undertaking of the Falkirk Joint-Stock Gas Company, in February last, they resolved upon a large scheme of renovation. The suggestion was made that a consulting engineer should be asked to report upon the condition of the works and the necessary operations to bring them into a state in which they could be worked with profit. Their Manager (Mr. P. B. Watson), however, placed before them a scheme of improvement, which the Commissioners, after considering with the help of visits to other works, adopted. The scheme consisted, shortly stated, of the introduction of Hislop's regenerative system of firing for the retorts, and of the Peebles oil-gas process for enrichment. Having resolved to proceed with the work, the contract for the regenerative retort-bench was let to Mr. C. M. Hamilton, of Glasgow. Mr. Watson kept the oil-gas installation in his own hands; procuring the necessary castings, and employing his own workmen to build in the retorts. The works are now all completed, and in working order; and on Tuesday last, a company assembled to celebrate the starting of the new plant. The regenerative retort-bench had been in use for about three weeks; and the ceremony resolved itself into the turning on of the oil to the Peebles plant, which was done by Provost Griffiths. In connection with the erection of the retort-bench, opportunity was taken to shift it to one side of the house—the old bench having been

in the centre—and to overhaul the retort-house. The walls have been renewed where necessary, and a new roof erected, which is supported in the centre and at one side by pillars. The retort-bench is a single one. At present a portion of the old bench opposite it has been left standing, and has been utilized for the oil-gas retorts. By-and-bye it is intended to remove the old bench entirely, and to place the oil-retorts in line with the new bench. Then the side of the retort-house facing the bench will be open; and as it is intended to bring a railway into the works, alongside the open side, there will be an ample coal-store along the whole front of the bench. The bench erected consists of eight ovens, in settings of eights—making 64 retorts in all. They are Ω shaped, 9 feet in length, and 22 in. by 14 in. inside diameter. The pit for the Hislop regenerator plant is 5 feet deep. A heat of 2300° is attained; and three-hour charges are worked. The oil-gas plant consists of a store-tank below ground, outside the works and on the opposite side of the retort-house from the coke-heap, which will reduce to *nil* the risk of any oil which might be spilt being set fire to by hot cinders. From the store-tank, the oil is pumped to an elevated cistern, from which it enters the manufacturing plant in the usual way. An elevated iron gangway has been erected about 6 feet in front of the retort-bench; and upon it are the taps which supply the oil direct to the ascension-pipes, by which the oil enters the retorts. There are eighteen retorts, of circular form, 22 inches in diameter, contracting to 15 inches at the mouthpiece, 8 feet long, and laid at a slope of 9 inches. The usual plan for the introduction of the oil gas into the coal gas is after the coal gas has been scrubbed and washed, and before it enters the purifiers. Mr. Watson sends his oil gas through the oil-condenser, and then through a special meter; and he afterwards brings it back and introduces it into the foul main, so that it has to travel with the coal gas through the condenser, scrubber, and washer before it reaches the purifier.

The company first inspected the works, and then assembled in front of the oil retort-bench. Provost Griffiths, Mr. R. F. Hislop, of Paisley, son of the patentee of the regenerative system, and the agent for the process, ascended to the elevated gangway. Mr. Hislop said they had met to inaugurate the important extensions which had been made upon the works by the introduction of a system of regenerative heating and of an oil-gas process. He had been asked, as representing his father, to perform the very pleasant duty he had now to discharge. The works to be inaugurated, he might say, would not only be a credit to them, but, he hoped, would be such as would abundantly justify their decision to adopt them. The action of the Commissioners had been very highly spoken of throughout the country; for they no sooner got the works into their possession than they set about, in the most business-like manner, to attain all that was possible by them. He had no doubt their action would be beneficial to the community. His duty now was to present Provost Griffiths, on behalf of the Patentees and the Contractors, with a key, as a small souvenir of the occasion; and he did so with the very greatest pleasure. Provost Griffiths, having accepted the key (which was of silver, and bore a suitable inscription), by it turned on the oil to the first retort. He then said he had to thank Mr. Hislop for the very kind way in which he had performed that interesting ceremony. Doubtless the regenerative system they had adopted would contribute very largely to the future success of the works, as well as to the prosperity of the town and locality. The old plant was in such a condition as to make it perfectly hopeless that any success would be attained by any effort of theirs; and therefore the best thing they could do was to set their minds to obtaining the highest possible results with the least possible expenditure of money. They had the necessary reports presented to them as to the alterations to be effected; and they had the results before them that day. While the production would be increased very largely by the system they had adopted, they would have, in addition, a great saving of labour. That had, however, not been effected without large outlay of capital; but they believed that the time was not far distant when the plant would recoup them. He thanked the Contractors for their kindness to himself, and for the way in which they had done their work. He trusted that the success which had attended them that day would continue for many years, until they were compelled to remove to larger premises.

Thereafter the company were driven from the works to the Crown Hotel, where a banquet was held. Provost Griffiths presided, and Bailie Weir was croupier. Mr. Hislop proposed the toast of "Success to the Gas Undertaking." He said his father was Manager of the old gas-works at Falkirk 38 years ago; and after holding the post for about four years, he gave it up. He, however, acted for many years as their Consulting Engineer. Subsequently he valued the works of the Falkirk Gaslight Company and of the Falkirk Joint-Stock Company, with a view to amalgamation. That amalgamation fell through; but he afterwards acted as Arbitrator in the amalgamation which took place. The gas undertaking was now under the Corporation, where, he was sure, it would rest; and under their careful management, and that of Mr. Watson, it was bound to prosper. The system of retorts now inaugurated was as complete as it was possible to make them. The settings had saved the Corporation of Paisley over £3000 a year; and they were being largely adopted, not only in this country, but abroad. He had no doubt they would return their entire cost within eighteen months. Corporations and gas companies must be abreast of the times; and he had no doubt they were now in that position. Provost Griffiths, in acknowledging the toast, said the gas undertaking was of very considerable value to the town of Falkirk. He supposed he need not go into the history of the purchase—let them take the undertaking as it is now. When they acquired the works, the gas was considered to be very high priced. The Committee were very anxious about this matter; and they spent many hours with a view to being able to effect a reduction. They had plans and reports before them; and they visited other towns to ascertain what was known in them of these two processes. They were favourably impressed that a regenerative system was the right one; but there were so many of them, that the difficulty with him was to make up his mind which was the best. They adopted this one; and the result had, he thought, in their short experience, justified them in adopting it. They had been able to take 5d. per 1000 cubic feet off the price of gas; while in the outlying districts, there was a further sum of 5d. which they did not now charge, so that the people outside the town were getting a reduction equivalent to 10d. per 1000 cubic feet. When they considered that the consumption of gas outside the town was one-third of the entire production, the reduction over the whole quantity was more than 5d. That reduction had, to some extent, discounted the saving which there would be by the new system. The cost of labour was very much reduced. Under the old system, for the week ending Aug. 29, there were 44 retorts at work, with 8 fires and 11 stokers; the make of gas was 695,800 cubic feet; wages amounted to £15 12s.; and the cost of stokers' wages per 1000 cubic feet was 5·37d. With the new system, in the week ending Sept. 6, there were 24 retorts at work, with 3 fires and 9 stokers; the make of gas was 1,512,000 cubic feet; wages amounted to £12 6s. 6d.; and the cost of stokers' wages per 1000 cubic feet was 2·03d.—showing a saving of 3·34d. per 1000 cubic feet. With the old settings, they were making 8400 cubic feet of gas per ton of coal carbonized; while they were now making 9000 cubic feet—an increase of 600 cubic feet per ton of coal. A thousand cubic feet of gas cost 1s. per ton for coal; so that 600 cubic feet extra was equivalent to a reduction of 7·22d. The estimated saving from coke per year with the new settings would be about 403 tons. The old system required coke from two retorts to heat six retorts in one oven; but by the new system the coke from two retorts heated eight retorts in one oven. These 403 tons of coke, at 7s. 6d., were equal to £151 2s. 6d. per year, or 0·5d. per 1000 cubic feet of gas—making a total saving of 11·06d. per 1000 cubic feet. Some people could not understand where they were going to spend such a large sum of money. He thought it was a business-like thing to do, to attack the old system and destroy it, and enter upon a new one. The enrichment of the gas by the oil process, which they saw him inaugurate by the simple turning of a tap, he thought would be of considerable value to them. They expected by this system to be able to give light which would satisfy the most fastidious person in the burgh; and they hoped to be able further to reduce the price of gas. Bailie Hamilton proposed "The Gas Manager." Mr. Watson, in acknowledgment, said it was not out of the labour of the men they would effect a saving, but out of the regenerative setting. He estimated that with the oil and coal they would get about 10,000 cubic feet of gas per mouthpiece, as compared with about 8000 feet under the old system. Mr. Beveridge, Parliamentary Solicitor for the burgh, proposed "The Town and Trade of Falkirk;" and a number of other toasts were given.

EXTENSION OF THE STRETFORD GAS-WORKS.

The extraordinarily rapid development, during the last two or three years, of the Manchester suburban districts of Stretford and Sale (the gas supply of which is covered by the Stretford Gas Company) has quite overtaken what were previously the adequate resources of the Company; and considerable extensions of their existing plant have thus been rendered absolutely necessary. To meet these increased requirements, the Company are now—under the direction of Mr. Benjamin Haines, the General Manager—carrying out an extensive reorganization and enlargement of their existing plant, which, when completed, will far more than double their present production. The scheme includes the erection of a large new retort-house, with retort-settings on the regenerative principle; the increase of the scrubbing and purifying plant; and the enlargement of the existing holders by putting on additional lifts. At present, only a portion of this scheme is being carried out; but it is anticipated that before the heaviest pressure of the winter demand comes upon the works, the additional plant completed will quite double the existing output of gas. It will bring the production up to about 40,000,000 cubic feet. The completion of the remaining portion of the scheme will be put in hand next summer. With the largely increased demand upon the gas-works, and the considerable enlargement of the requisite plant, much heavier and more responsible duties have necessarily fallen upon Mr. Haines; and, in order that he may have relief from some of these duties, it was decided, upon the resignation of Mr. Hughes, the late Assistant-Engineer, that Mr. H. Kendrick should be appointed as Engineer to the gas-works (as intimated in the JOURNAL a fortnight since), with full charge of the carbonizing.

THE COVENTRY CORPORATION GAS UNDERTAKING.

Paving and Gas Profits.

At the Meeting of the Coventry City Council on the 8th inst., the question of the appropriation of the profits of the gas undertaking was discussed on a motion by Mr. James to the effect that the Finance Committee should be instructed, in preparing the estimates for the forthcoming district rate, to include a sum equal to one-third of the gas profits for the year ending the 25th of March last, to be expended in repaving the footpaths in the centre of the city. The mover of the resolution remarked that some time ago he had a similar motion, asking the Council to repave certain streets. This had been done in some cases; but since 1891 they really had not had any money to spare for improving the footpaths without coming upon the ratepayers rather heavily. He was pleased to say that at the present time they had a very large sum coming from the profits of the gas-works. The original sum was £5600; but there had been £864 paid into the sinking fund—with which he did not propose to deal. He purposed taking one-third of the net amount of the sum the Gas Committee handed over to the district rate, which would be one-third of about £4736. He felt that, in making this proposition, he was really assisting Alderman Tomson, the local Chancellor of the Exchequer, in the preparation of his budget. Mr. Band seconded the motion. Alderman Tomson thanked Mr. James for his kind advice, but said he was certainly sorry to inform him he intended moving an amendment to his resolution. In the first place, he thought it an unbusinesslike way of dealing with the matter. He was in sympathy with the desire to improve the footpaths of the city; but he thought

the question ought to be approached in the regular way. Let it be a reference from the Council to the General Works Committee. If the Committee were rather lax, it was quite open to the Council to pass a resolution to stimulate them. This would be the effect of the amendment he intended to propose. He did not like any "fancy" way of dealing with the gas profits. Those profits belonged to the Corporation, and ought to be dealt with as a matter of business, like any other portion of their income. Mr. James's motion would not pledge the Council or the General Works Committee to improve the footpaths; it would simply pledge the Finance Committee to set aside money for the purpose. His (Alderman Tomson's) plan would be rather quicker in operation than Mr. James's. Another objection was that they had spent a lot of this money already; and there was very little left to deal with. The proper way, in his opinion, would be for the Council—if the time had come when the footpaths of the city needed looking to—to instruct the General Works Committee to draw up a plan or statement as to what footpaths they considered were in need of repair, what kind of repair, and in what order they should be done. If that was the feeling of the Committee and the Council, he would take care that, in the estimates, a sufficient sum was put year by year until the Council were satisfied with the state of the footpaths. His amendment would simply be—"That the state of the pavements in the centre of the city be referred to the General Works Committee, with a view to their improvement." Alderman Gulson seconded the amendment; remarking that it seemed to him a very unbusinesslike way of dealing with any part of the gas profits to appropriate them to certain things. He had before expressed his opinion that the Council were not doing their duty in appropriating so large a proportion of the gas profits to the consumers, and so little to the wants of the ratepayers. When they acquired the gas undertaking, the argument in favour of the step was that it would bring them in a very large revenue, as it did in other towns—Birmingham and Leicester for instance—that would be in aid of the rates. In Coventry, they had from time to time reduced the price of gas, and given the profits to consumers to an extent that was not at all needed in their interest, and was very deleterious to the interest of the ratepayers. He hoped the time was not far distant when the ratepayers themselves would see this was not fair dealing with them when they undertook the responsibilities of a great business. He trusted this part of the policy of the Gas Committee would be changed. Mr. Andrews (the Chairman of the Gas Committee) opposed the motion, though he could hardly say he approved of the amendment. He was rather sorry Alderman Gulson had introduced the question of the ratepayers *versus* the gas consumers. In so doing, he thought he had gone a little out of his depth, because the policy in Coventry was exactly similar to that pursued in Birmingham—a gradual reduction made in the price of gas, and a substantial sum given to the ratepayers. It was very convenient, no doubt, for the Gas Committee to make a surplus profit on the year's trading, and then for Mr. James to dispose of it so nicely. He trusted the Council would not agree to the resolution, but leave it to be dealt with by the Finance Committee in the ordinary way. Mr. James said he would be very pleased if the Finance Committee would deal with it; only he thought an instruction from the Council would assist them, and make them open their hearts more generously. If Alderman Tomson thought his was the better plan, and assured them that he would introduce the matter and make provision for it, he (Mr. James) would be willing to accept it, and withdraw his proposition. This was assented to by the seconder; and the amendment was then put as a substantive motion, and carried.

ELECTRIC LIGHTING NOTES.

The greater part of last Wednesday's sitting of the St. Pancras Vestry was devoted to a discussion on the cost of the electric light, the recently-introduced high voltage, and kindred subjects. Mr. Cox thought the lighting rate should be reduced; but Mr. M'Gregor maintained that, now electricity had been taken up, a higher rate would be required to meet the Vestry's difficulties in that direction. Mr. Hodgson said they had been told that the electric light would cost nothing; and with the new installation, it ought to cost less than that. During the last two years, the light had cost £9367 19s.; while the 561 gas-lamps displaced would only have cost £3309 18s. The electric light had therefore cost the ratepayer £6058 1s. more than the former gas-lamps would have done. During these two years, the Lighting Committee had made no profit; and there was an estimated deficiency of £788. Mr. Menzies said the previous speaker had forgotten to mention that the debit balance two years ago was between £3000 and £4000; while it was only £788 this year. He readily admitted that the electric light cost two-and-a-half times or even three times as much as gas; but against this must be placed the fact that it gave nine times the light of gas. The 95 arc lamps were of an average power of 600 candles—making 57,000-candle power; and the 561 gas-lamps displaced had only 12 or 14 candle power, or a total of about 7000 against 57,000 candles. Therefore the ratepayers were getting far better value for their money; while the cost of working was gradually being reduced. All beginnings were expensive; but in the end the new light would beat gas by a long chalk. After this little duel, the report of the Electricity Committee came up; and several applications for current were received. Mr. Hodgson asked if these were to be run at 220 volts. On receiving an affirmative answer, he moved that, as the Vestry had fixed the standard pressure at 110 volts, they could not grant these requests for current at 220 volts, not having complied with sub-section B of the Act. The first installation was carried out in 1890 by Professor Robinson, under the direction of the Vestry; and it was designed to supply current at 110 volts. Later on, another station, also for the same voltage, was erected. The Vestry had therefore laid it down that the standard voltage was fixed at 110. But on the 12th ult., a notice was sent out to new and old consumers stating that the supply would be delivered at 220 volts. What authority had Mr. Baynes (the Electricity Engineer) to raise the voltage? Mr. Brown then seconded the motion. Mr. Sweet (the Chairman of the Electricity Committee) said the Vestry were bound to grant these applications. They had the sanction of the Board of Trade to supply at a pressure of even 300 volts; and the Committee had decided to raise it at the new station to 220 volts—to the enormous advantage of distribution. Indeed, if Mr. Baynes had done no other stroke of business for seven years, he would have earned his salary. Mr. M'Gregor pointed out that the question was that the Committee had altered the voltage and erected ventilators without the permission of the Vestry. Eventually, the motion was lost; Mr. Hodgson defiantly threatening to communicate direct with the Board of Trade. Mr. Hodgson inaugurated another lively discussion by moving that the Electricity Committee be instructed to prepare a return of the houses where the public roads and footways had been taken up for the purpose of substituting india-rubber tubing for the braiding to the service-lines from the Vestry's electric mains to the consumers' premises, and the probable cost of executing this work. Mr. Sweet explained that the alteration had been ordered by the Board of Trade. Dr. Smith said the object was to prevent leakage. It was understood that this item alone would cost between £300 and £400; and Mr. Markham thought the Committee were exceeding their duty in not getting the sanction of the Vestry for so large an expenditure. Mr. Hunt said the Vestry had apparently no check on the Electric Light Department, who acted quite independently. Mr. Wettenhall asked whether this was not practically a new scheme. Mr. Sweet replied that it was only making the connections more perfect—a reply which his querist declared he received *cum grano salis*. The return asked for was, in the end, promised.

Last Thursday, the Hampstead Vestry decided that the question of raising a further loan to meet the liabilities incurred in carrying out the electric lighting undertaking in the parish be referred to the Finance Committee. It may be incidentally mentioned that the total indebtedness of Hampstead amounts already to £146,784 at various rates of interest averaging 3⅜ per cent., and that the London County Council are to be asked to lend that sum to the Vestry at 2¾ per cent., in order to wipe off the 35 different loans. It is therefore problematical whether the ratepayers will view this further proposed electric lighting loan with equanimity. An application was received from a parishioner for permission to light his outside lamp with the electric light; and the Committee recommended that this be granted, "provided he will take the supply of electricity from the Vestry, and sign the usual agreement." Mr. Johnson strenuously objected to this qualifying clause, which he thought was an arbitrary use of the Vestry's powers. But the Chairman of the Committee emphasized the importance of maintaining the "rights" of the Vestry; and the proposed course was adopted after some discussion. The Vestry refused to consider the application of the three Assistant Electrical Engineers at the central station (who now receive the munificent wage of £100 per annum) for an increase of salary. The Chairman reported that the Vestry had now 17,000 lamps connected, and applications for current that would make a total of 20,000 lamps by Christmas. Here Mr. Johnson pertinently inquired what was the percentage of current lost in transit from the central station to the consumer; but the Chairman (Mr. H. Harben, J.P.) declined to allow the question to be put without notice, or to "allow a member to cross-examine an official of the Vestry." Later on, Mr. Johnson found an opportunity of stating that he believed the loss of current to amount to 66 per cent.; and therefore he thought there must be something wrong to allow such gross waste. He also moved that the Electric Lighting Committee should report on the absence from their recommendations of any proposals to extend the public lighting. The Chairman replied that this was the first time he had heard of the alleged waste of current, and that the Committee were doing all they could to obtain a dividend before incurring further expense.

The action of the ratepayer of Wimbledon in circularizing his fellow-ratepayers on the subject of the electric lighting scheme which the District Council have decided to adopt, alluded to last week, has not been altogether fruitless. A representative meeting was held the other day in the Drill Hall; and an almost unanimous resolution was passed to oppose the Council when the official inquiry is held in regard to their application for funds for carrying out the scheme. The Council are called upon not to proceed without making further inquiries. The Chairman of the meeting (Mr. T. C. Summerhays) was quite neutral; he was neither a supporter nor an opponent of the project. The burden of his speech was that he thought the existing oil lighting compared favourably with the gas lighting which preceded it; but there was a desire for a change, and he did not mind, so long as the rates were not increased. "That's the point," cried a voice. Mr. Cooke, the Chairman of the Ratepayers' Association, moved the opposing resolution; and it was seconded by Mr. Ely, who spoke, from personal experience, in support of incandescent gas lighting. Mr. Crickmay, who had voted for the scheme when it was before the Council, now opposed it. Mr. Ansell asked if the electric light was worth the money proposed to be spent upon it, which he put at £40,000 before they had done with it. A luxury like that would, he said, mean an increase of 5d. in the pound in the rates, which at present amount to 1s. 7d. Mr. A. Arnold, J.P., the Chairman of the District Council, justified their action in taking up the electric light question again. The present lighting was, he said, emphatically pronounced to be unsatisfactory; and the choice lay between it and electricity—for they could not entertain gas. Mr. Preece's figures, which had been carefully checked, showed that electricity was the more economical, taking into consideration the better light that would be obtained. But it would not be necessary to spend the £30,000 estimated—in fact, not more than £25,000; and the repayments on this would come to between £1300 and £1400 a year. The Council would provide electric light at about the present charge for gas, and would be able to take it into every quarter of the town, whereas if a company came in they would only take it where there was a chance of making money. Mr. Preece rose to address the meeting; but he was received with impatience, and was eventually obliged to resume his seat.

The formal inauguration of the electric street lighting of Newport (Mon.) took place on Monday afternoon last week; the engines, five in number, at the generating station being started by the Mayor (Mr. J. C. Sanders), in the presence of a numerous company. The Chairman

of the Electricity Committee (Alderman Moses) asserted that, from an engineering and electrical point of view, Newport had almost perfect works, and that the installation was an unqualified success. Subsequently the first electric street-lamp was started by the Mayoress from a table in the Town Hall.

Last Tuesday, the electric supply station of the Stafford Corporation, of which some particulars were given in the JOURNAL for the 1st inst. (p. 687), was formally opened. The assembled company having been admitted into the station by the Chairman of the Gas and Electricity Committee (Mr. W. H. Peach), who explained the origin and growth of the scheme, the Mayor (Mr. C. H. Wright) started the first engine; the second and third being started by Alderman Silvester and the ex-Mayor (Mr. G. Wormal). The light was switched on by the Mayoress. The station was designed by Mr. J. Ferguson Bell, the Gas and Electricity Engineer of the Corporation; and it has cost £20,000.

The quiet town of Reigate has been exercised over the electric lighting question; and, at a special meeting of the Town Council on Monday last week, the Mayor (Alderman W. Brown) introduced the matter by bringing forward an item on the *agenda* to the effect that the Council should consider the expediency of applying to the Board of Trade, pursuant to the Electric Lighting Acts, 1882 and 1888, for a Licence or Provisional Order authorizing the Council to supply electricity within the area of the borough. A letter was read from a resident, who said he had had experience in the working of several installations, and, with every belief in the future development of the electric light, he had yet to learn of a town, with a scattered population, of about the size of Reigate, or Reigate and Redhill combined, in which the light was a dividend-paying investment. He suggested that, before the Council undertook the lighting of the borough by electricity, inquiry should be made as to this, as any loss incurred would mean an increase in the rates. Mr. Powell moved that a Sub-Committee be appointed to investigate the matter, with authority to employ a professional engineer to advise as to cost, &c. Mr. Giles seconded the motion. A long discussion ensued; and, as mentioned elsewhere, it raised the question of the right of shareholders in the Gas Company to join therein or vote on the motion. Eventually, it was carried by 15 votes to 3; and the Sub-Committee was appointed.

A special meeting of the Wakefield City Council was held last Tuesday, to receive the minutes of the Electric Lighting Committee, who recommended the Council to accept tenders for the following electric lighting plant: Supplying and erecting boiler-house plant, engine-house plant, and suitable board and instruments, £10,900; transformers and switch-board, £448; supply and erection of underground work, £3192; supply of arc lamps and posts, £252; supply of meters, £223; erection of an overhead crane, £253. After the matter had been discussed in private, the adoption of the recommendations was duly moved; but an amendment was proposed referring the matter back to the Committee. There were 13 for the motion, 4 for the amendment, and 15 absent; consequently the motion was carried. It is expected that when the sanction of the Local Government Board to a loan to defray the cost of the works has been obtained, the scheme will be at once proceeded with.

Some opposition was raised at the last meeting of the Plymouth Town Council to the proposal of the Works Committee that a deputation should visit other towns and make inquiries respecting the electric light. The contention of the opponents of the project was that the Corporation already had their hands full of schemes, and that the time was inopportune for acting upon a speculative undertaking of this nature. On the other hand, it was said that, if the Corporation did not introduce the electric light into Plymouth, outsiders would do so; and that the element of speculation was more apparent than real, because corporation electric lighting works had paid where they had been established. The resolution in favour of the "picnic," as one gentleman called it, was carried; the suggestion being made that the deputation should also inquire into the advantages of incandescent gas-lamps for public lighting.

A Livesey Washer for Blackburn.—The Blackburn Corporation have had one of Livesey's washers fitted into the bottom of one of their tower scrubbers; the Contractors for the work being Messrs. R. Dempster and Sons, Limited, of Elland.

The Scarborough Gas-Works Purchase Question.—According to the minutes submitted by the Joint Committee of the Parliamentary Bills Sub-Committee and the Finance Committee at the meeting of the Scarborough Town Council on Monday last week, the members have been busily engaged in further considering the question of the purchase of the Gas Company's works. Correspondence has passed between a Special Sub-Committee and their expert adviser (Mr. Corbet Woodall) and the Company. As a result, the Sub-Committee recommended that the undertaking be acquired by the Corporation if it could be purchased for a sum to be named by the Joint Committee. The latter, however, referred the matter back to the Sub-Committee.

Important Concessions to the Gas Consumers at Stockport.—When a Gas Committee find themselves able to hand over, in the shape of reductions, something like £8000 to the gas consumers within a twelvemonth, there is at least evidence of consideration on their part; and that they are in a position to do this implies good management. This is the gratifying condition of things at Stockport. Last March the Committee reduced the price of gas 2d. per 1000 cubic feet. This meant a loss in revenue of £3456. They have now decided, subject to the approval of the Council, on making further concessions, as follows: 1d. per 1000 cubic feet reduction in the price, 2½ per cent. discount on all accounts paid within a month, and the abolition of meter-rents. The first will mean an annual loss of £1728; the second, one of £1450; and the third, one of about £1000. This last is practically a further reduction of ¾d. per 1000 cubic feet; and it at once does away with a source of grievance. In addition to these concessions, the outside consumers have been allowed an additional 1d. per 1000 cubic feet, which makes the differential rate 5d. as against 6d., the figure at which it has stood for upwards of thirty years. The total loss in revenue consequent upon these alterations will amount to £8084. The Committee and the Gas Engineer (Mr. S. Meunier) are alike to be congratulated on being in a position to make it.

METROPOLIS WATER SUPPLY.

The Future Source of Water—Lord Farrer's Criticism of the Royal Commissioners' Report.

As mentioned in our article on "Water and Sanitary Affairs" last week, the letter by Lord Farrer on the future source of water for London, given in the same issue (p. 794), drew from a correspondent, signing himself "X," a reply which appeared in *The Times* on the 12th inst. This, with a short letter from Lord Farrer, dealing with the points raised by "X" and Mr. George Livesey, alluded to last week, we reproduce below:—

To the Editor of *The Times*.

Sir,—The letter in which Lord Farrer expresses in your columns his dissatisfaction with the report of the Royal Commission that inquired, in 1892, into the London Water Supply, will doubtlessly be read by a vast number of persons who have neither time nor inclination to study the report itself, or the bulky evidence on which that report was based. Will you, therefore, allow one who is conversant with those documents to make some observations on Lord Farrer's letter?

There were two main questions before the Commission: (1) Could an adequate amount of water for the prospective requirements of London be obtained from the Thames and Lea Valleys, with due regard to the claims of the other inhabitants of those river basins? (2) Would the water thus obtained be of satisfactory quality? Both of these questions were answered by the Commission in the affirmative.

As regards the second question, relating to the quality of the water, Lord Farrer, though he expresses his assent in a somewhat grudging fashion, appears to be in agreement with the Commissioners. His only objection to them under this heading is that, seeing that the water, in their (and apparently in his) judgment, is of satisfactory quality, it was inconsistent on their part to insist upon additional precautions being taken to keep sewage out of the rivers, and to secure adequate storage and filtration. This criticism appears to me to be at least somewhat captious; and I fancy that few persons will agree with his Lordship in finding fault with the Commission for having, even if unnecessarily, attempted to strengthen the barriers by which impurity is excluded from the water-mains.

It is, however, against the Commission's answer to the first question—that which relates to the quantity of water—that Lord Farrer directs his chief attack. His objections, shortly put, are three: (1) That the Commissioners limited their consideration of future requirements to the next forty years, and were silent as to what would happen when that period was ended; (2) that the scheme of storage reservoirs at Staines, of which they expressed their general approval, has been found, "on careful examination by the London County Council, to be extravagant in cost and of very doubtful efficiency;" and (3) that the Commissioners did not compare the merits of this scheme with those of any other scheme, such as bringing water from Wales.

As regards the first of these three objections, it must be manifest that it was absolutely necessary for the Commission to fix some limit of time in their inquiry as to future requirements. It was impossible for them to examine into the question whether the Thames and Lea Valleys could provide sufficient water for Londoners for all eternity. Some fixed point or other must necessarily be assumed, or it would be impossible to estimate, even roughly, what the future requirements would be. Whatever period was selected, it would always have been possible for a hostile critic, such as Lord Farrer, to say, "But what is to be done when that period is over?" The Engineer of the London County Council, who appeared as the mouthpiece of the Water Committee of that body—a Committee of which Lord Farrer is ex-Chairman—wished a period of fifty years to be taken. The Commissioners, for reasons set forth in their report (par. 27), preferred to take forty years. Supposing, however, they had assented to the Council's proposal, and taken fifty years as their prospective period, Lord Farrer's objection would have been just as valid as it is now.

What the Commissioners would have reported as to the amount of available water, had they looked fifty instead of forty years ahead, can only be conjectured. An examination, however, of the figures cited by them in their report (par. 182) leads to the pretty sure conclusion that they would have reported much as they did with the forty years' limit. For they state that the average flow of the Thames at Teddington is about 1350 million gallons per day; and, as only 200 millions are required as a minimum for the purposes of the river below Teddington, it is evident that, when the 300 millions, which they think will be required in forty years' time, have been abstracted, there will still remain an average daily amount of 850 million gallons on which to draw for consumption. It becomes, then, simply a question of possible storage; and it is difficult to believe that, seeing the water is there, the storage of it somewhere in the Thames Valley is beyond the power of modern engineers.

As regards the second objection made by Lord Farrer, it would be of much interest to know what were the grounds and the evidence which led the County Council, on careful examination, to the conclusion that the scheme of storage reservoirs at Staines would be "extravagant in cost and of very doubtful efficiency." It may, I suppose, be assumed that the Council accepted this view on the authority of their Chief Engineer. Of that gentleman I would speak with all respect; but it is manifest that an engineer, however professionally distinguished, who has a gigantic water scheme of his own, is not an impartial witness as to the merits or demerits of a rival project. If that engineer thinks the storage scheme extravagant in cost and of very doubtful efficiency, the at least equally distinguished Engineers, Mr. T. Hawksley and Sir F. Bramwell, expressed a contrary opinion; for they found "that the sites proposed for the reservoirs are suitable for their intended purpose, and capable of being constructed at a moderate expense" (par. 86). Doubtlessly before any final adoption of the Staines storage scheme, its cost and efficiency would have to undergo much more complete and detailed examination at the hands of experts than could be expected from the mixed Royal Commission of 1892. But to dismiss a scheme that has approved itself generally to such competent judges as the late Mr. Hawksley and Sir F. Bramwell, not to speak of the Engineers who served on the Commission, in deference to the adverse

judgment of a gentleman with a rival scheme of his own, would be the height of folly.

There remains Lord Farrer's third objection—that the Commissioners did not compare the merits of the scheme of reservoirs at Staines with the merits of such a plan as that of bringing water from Wales. Surely Lord Farrer must be aware that the area of inquiry by a Royal Commission is limited by the terms of the official document under which it is appointed. Has Lord Farrer taken the trouble to read that document, which is prefixed to the Commissioners' report? He can hardly have done so; for otherwise he would have known that any comparison such as he thinks the Commissioners should have instituted was utterly outside the reference to them. They had no more authority or power to examine into the merits of a supply of water from Wales than to investigate, let us say, the finances of the London County Council. Their business was to inquire whether water of adequate quantity and quality could be got within the Thames and Lea watersheds; and they—very properly, in my judgment—limited themselves strictly to the question which had been referred to them.

The following is Lord Farrer's reply:—

To the Editor of *The Times*.

Sir,—Your anonymous correspondent "X" really reduces the discussion to a question between the merits of a scheme for huge storage reservoirs at Staines and a scheme for bringing a fresh supply from Wales. I shall not think my letter wasted if it has the effect of drawing attention to the importance of this question, which, as "X" admits, was not touched by the Royal Commission. In considering this question, it will be important to know whether the Water Companies, who suggested the Staines scheme, are taking any steps towards its accomplishment. It will also be important to consider whether the expense of the Staines scheme, if proceeded with, is to fall on the present sources of income of the Water Companies, or whether fresh rates will have to be imposed for the purpose on the London water consumers.

As regards Mr. Livesey's doubts concerning the future growth of London, we are all of us, of course, very much in the dark; but it is interesting to see how little the very able Commission presided over by the Duke of Richmond foresaw the present size of London. It must also be remembered that the growth we have to consider is not the growth of population in Central London or in County Council London, but of the population contained in the much larger area of the Water Companies—or, rather, in the whole area which is now supplied by water from the valleys of the Thames and Lea. The tendency appears to be for the population of London and its suburbs to grow at the circumference, while it becomes less dense at the centre.

Writing to *The Times* last Thursday, Colonel Makins took up the question asked by Lord Farrer as to meeting the expense of the Staines scheme, if it should be proceeded with. He said: "If either the Companies, or the London County Council, or a Water Trust, or any other competent body, apply to Parliament for powers to raise capital to be expended in providing a further supply of water beyond that for which the present capital powers have been granted, it is obvious that such capital must be granted on such terms as would enable the Companies, or the Council, to raise it; and the security for such capital must in the case of the companies be power to charge for supply of water, and in the case of the Council the general rates, which would, of course, include a charge for water supply." Colonel Makins added that Lord Farrer seemed to contemplate the possibility of the Water Companies being called upon to "make bricks without straw." He said he had not so learned the practice of Parliament. Whatever authority or corporation was entrusted with the responsibility of raising the requisite funds, would be provided with the only means of securing them—viz., the power to charge for the supply of water. Anything less would, in his opinion, be injustice; anything more, unnecessary. Lord Farrer thought Colonel Makins had not answered his question; for, in a letter published last Friday, he said: "What I want to know from the Water Companies, with respect to the scheme they have themselves proposed for large reservoirs at Staines, is whether they are prepared to make those reservoirs with capital raised upon the credit of the rates they now have power to charge, or whether, when they come to Parliament (as they are bound to do) for powers to make those reservoirs, they intend to ask for some new rating or charging powers in addition to those which they already possess."

The London County Council and the Water Question.

At the Meeting of the London County Council last Tuesday—Sir A. Arnold in the chair—the question of the water supply of the Metropolis was under discussion, on the presentation of the following report by the Parliamentary Committee:—

On the 9th of July, we reported to the Council that, in view of the dissolution of Parliament, we had instructed the Agent to take steps to suspend the Bills for the purchase of the Water Companies' undertakings until next session. The proceedings as to the Lambeth and Southwark and Vauxhall Bills and the decisions of the Select Committee have been reported by us to the Council. At the dissolution, the position was, briefly stated, as follows: The case of the Council was closed, and that for the Water Companies and the Local Authorities was within a few hours of completion. Agreements had been entered into, as regards the Lambeth and Southwark and Vauxhall Bills, with the County Council of Surrey, on their own behalf, and as representing the Corporations of Richmond and Kingston, the Urban District Council of Surbiton, the Parish Council of Mitcham, the Urban District Council of Wimbledon, the Rural District Council of Epsom, the Rural District Council of Croydon, and the Parish Council of Long Ditton; and also with the Corporation of Croydon, the other principal Local Authority concerned. So that, as regards the Southwark and Vauxhall case, all the Local Authorities are satisfied. As regards the Lambeth case, the Local Authorities of about 29-30ths of the area are also satisfied; but the Beckenham Local Board (about 1-30th of the area), which is partly supplied by the Lambeth Company and partly by the Kent Company, have not at present agreed, as their object is to secure for themselves a supply of the Kent water in substitution for that supplied from the Lambeth Company's works. The other six Bills awaited second reading. The eight Bills having been suspended, we have had to consider what course should be adopted in regard to them; and, after discussion, we have decided to recommend—"That, desiring that the supply of water in the Metropolis and the surrounding districts should be in the hands of a public authority, and with a view to a complete agreement with all parties concerned over the entire area supplied, the Council do invite Her Majesty's Government either to deal with the question themselves or to appoint a Royal Commission to do so."

Colonel Hughes, M.P., moved the adoption of the recommendation; explaining that he did so in place of Mr. M'Kinnon Wood, the Chairman of the Committee, who was in the minority when it was before them. He argued that, if only the Government would take up this matter, an enormous saving of time and money would be effected.

Mr. J. Stuart, M.P., moved, as an amendment, that the Bills be proceeded with. He maintained that all that was proposed by the Committee had been already done. In all that was necessary for legislation, this matter had been fought out and placed before the public, and was now in the position in which it ought to be dealt with by Parliament. It was on this ground that he asked the Council to go on with the policy they had hitherto pursued.

Mr. M'Kinnon Wood formally seconded the amendment.

The Earl of Onslow thought that, knowing there had been a narrow escape from a very serious calamity at the East-end, there were not many on the Council but would agree with him that the time had come when they could not any longer allow the water supply of London to remain in private hands. He believed they were now almost unanimously agreed that the undertakings of the Water Companies must be purchased. But the whole matter was enshrouded in great difficulty. He did not consider the County Council were the body to be the Water Authority. It would be work of the greatest delicacy to adjust the negotiations and relations between the Council and the authorities of the several districts now served by the Companies. The best course he considered to adopt in the position in which they found themselves was to appeal to the Government, who could themselves immediately take the matter up, or refer it to a Royal Commission. If the latter course were adopted, the Commission should devote themselves to considering the following matters: (1) What shall be the Water Authority for the whole area? (2) What shall be the terms that shall be referred to the Arbitrators? (3) The question of additional supply. If they went on with the Bills of last year, they would have to pay £60,000,000 or £70,000,000 for the property of the Companies. What he asked the Council to do was just for a moment to abandon the attitude they sometimes assumed, and show a little modesty in their assurance that they were the best body to decide this question. The suggestions of a properly constituted Royal Commission would bear more weight in the present House of Commons than those emanating from the Progressive party of the Council.

Sir J. Hutton supported the amendment. He observed that what they wanted in this matter now was not a Royal Commission, but an Act of Parliament.

Mr. Westacott expressed the belief that, if the recommendation were adopted, it would hasten the time when the water-works would be acquired.

Lord Farrer said that, under present circumstances, if the Council proceeded with the Purchase Bills, they would in all probability have to pay the Companies an extravagant sum. He had always thought that the true policy would have been to have brought together all the Local Authorities, and made them agree with the Council, instead of being at daggers drawn; and when they had them with them, to face the Companies. This, however, had not been done; and the Council were at loggerheads with them all. There were many considerations which made him feel that, by going on with the Purchase Bills, they might be throwing upon London very great expense. He did not think he would vote for a reference to a Royal Commission. The last Commission had not inspired him with such confidence as to make him desire another. But, at any rate, going on with the Purchase Bills was the worst course they could adopt. It would be better for them to continue their examination of the Welsh scheme, and see whether the Companies would bring forward their plan for reservoirs at Staines. Let them be prepared on every occasion to fight the Companies, and insist on their doing their duty. But the worst and most dangerous course was to proceed with the Purchase Bills of last session.

Mr. W. H. Dickinson strenuously opposed the recommendation; expressing surprise and disappointment at the opposition which Lord Farrer now presented to the Purchase Bills.

Mr. Dickinson's speech was listened to with great impatience, and amidst constant cries of "Divide."

Ultimately, on the closure being carried, the amendment was put; and, on a show of hands, it was declared carried. A division was then taken, when there voted: For the amendment, 53; against, 54—majority, 1. The result was received with loud cheers by the Moderate members; and the debate was adjourned.

The consideration of a long report by the Water Committee with reference to an inspection of water areas in Wales which had been carried out by several members of the Committee during the recess, was postponed.

COMPLETION OF THE NEW WATER SUPPLY FOR COVENTRY.

A Description of the Works.

The new water-works of the Coventry Corporation at Whitley are now finished; and the citizens are in possession of a supply of water which will suffice for many years to come. The new scheme was adopted, and the work commenced, under the advice of the late Mr. T. Hawksley; and, on his death in September, 1893, he was succeeded in the position of Consulting Engineer by his son, Mr. C. Hawksley. A short general description of the new pumping-station appeared in the Journal for Sept. 24 (p. 646); but some additional particulars as to the machinery and reservoirs have been furnished by the Engineers. The station is situated on land which belonged to the Corporation prior to the passing of their Water Act of 1889; and it comprises an engine and boiler house, coal-shed, well, borehole, and driftways, cottage, and weighing offices. Two engines of the rotative single-cylinder, expansive type (the cylinders 27 inches diameter and 5-feet stroke) are supplied with steam from three Cornish boilers, each 24 feet long and 6 feet in

diameter. The well is of elliptical section, 14 feet by 9 feet in the clear, and about 150 feet deep, measured from the level of the engine-house floor. From the bottom of the well, a boring 24 inches diameter extends to a further depth of 100 feet; and driftings for collecting and conveying water to the well are driven at two levels thereat. Two pumps of the single-bucket description have been placed in the well, and are 13¾ inches in diameter by 4 ft. 3 in. stroke. Each pump lifts its water into a cistern, of which there are two, placed at the top of the well, and from which the water is forced by means of ram-pumps, having 17 inches diameter rams, and strokes of 2 ft. 6 in. The pumps are intended to make 16 complete strokes per minute; and at this speed, they should each deliver into the main pipes leading into the Barker's Butts service reservoirs 561,600 gallons of water per 24 hours, or, allowing for actual stoppages, say 500,000 gallons per diem—thus affording, when both engines are working 24 hours, a supply of a million gallons per diem. The water is delivered by the pumps into a main pipe 14 inches diameter, extending from the pumping-station to the junction of Fleet Street with Hill Street, where the main pipe becomes 18 inches diameter, and is continued to the Barker's Butts reservoirs. The total length of the main pipe is nearly four miles. The reservoirs are constructed of brick, and are each 160 ft. 6 in. long, by 147 feet wide, by 12 ft. 6 in. depth of water, with a capacity of 1,500,000 gallons. The total capacity of the two reservoirs is therefore 3 million gallons. Each reservoir is furnished with a recorder house and instrument for recording upon diagrams the water-level at every minute of the day. The lowest level to which water can be reduced in the well by pumping is 85 feet above Ordnance datum; and the top water in Barker's Butts reservoirs is 384 feet above Ordnance datum. The power or work done in each pump when pumping from the bottom of the well to the top of the water-level in the Barker's Butts reservoirs is nearly 40-horse power. The total cost of the works, including the new reservoirs, is stated to be about £65,000, though the accounts are not yet finally adjusted. The works were opened on the 9th inst.; the ceremony of starting the engines being performed by the Mayor (Alderman Loudon), at the request of the Chairman of the Water Committee (Alderman Read). On the invitation of his Worship, a large company afterwards sat down to luncheon in St. Mary's Hall.

THE GODALMING TOWN COUNCIL AND THE WATER-WORKS.

A Provisional Agreement to Purchase.

Negotiations between a Special Committee of the Godalming Town Council and the Directors of the Local Water Company have resulted in an agreement by which the Corporation have been recommended to buy, and the shareholders to sell, the water-works for £37,500, subject to the mortgages of £5500, and to all the existing contracts between the consumers and the Company. According to a report which was laid before the Town Council by the Special Committee a short time since, the Company was registered in the year 1878. In 1882, a profit was first made on the revenue account; and the Company declared their first dividend in the following year. In 1885 and in 1893 and 1895, the droughts occasioned great difficulties of supply; but these difficulties seemed to have been due to a deficiency of mechanical power rather than of material, and to the fact that, by taking customers so far afield as in Bramley and Shackleford, instead of confining themselves to the limits of the borough, the Directors crippled the whole of their area. These difficulties will necessitate a further expenditure on additional machinery or storage of some kind or other. The last report of the Company shows a balance of £1000 available for dividend, exclusive of mortgage debentures. Assuming, therefore, that the Corporation bought the works for £38,500, and that a loan at 4 per cent. was borrowed for the purpose, and that 50 years were allowed for repayment, the annual instalment of principal and interest required would be £1787; leaving a deficiency of £787 to be made up out of the rates. It was, however, very probable, said the report, that the mortgage debentures—amounting to £5500—would also have to be paid off on the winding up of the Company. In that case the money would also have to be borrowed, and an extra sum of £110 a year would have to be found to pay off the £5500—making £897 to be supplied out of the rates. Should additional works have to be constructed, and a further sum of £4000 borrowed, this would add an additional £92; making a total deficiency of £989 to be supplied out of the rates. Against this, the expected increase in the earning capacity of the undertaking must be taken into consideration; and a probable saving in working expenses. The Committee, in a supplementary report, also showed the actual amounts required upon the supposition that £48,000 was borrowed at 4, 3½, and 3 per cent. respectively, with interest only payable during the first five years; and the capital and interest by equal instalments during the next 55 years—making the total period 60 years. The Committee also reported that the Council had paid the Company £208 for water in the past two years, and that in future a very considerable quantity of water would be required for flushing tanks forming part of the new drainage scheme. The Committee recommended that the Company's undertaking be purchased on the terms already stated, and that they should be empowered to carry out all requisite formalities, and, if necessary, promote an Act of Parliament. The discussion on the proposals was of considerable length; and the recommendations were carried by the casting vote of the Mayor (Mr. W. Pullman). The shareholders of the Company, at an extraordinary general meeting held last Tuesday, confirmed the proposed transfer on the above-mentioned terms.

A New Retort-House at the Leeds Gas-Works.—The Leeds Corporation Gas Committee have decided to build an additional retort-house at the Meadow Lane works. Last winter all the retorts at the different stations were in use; and the Committee think it advisable to be prepared to add another house in case the demand during the next few months should make it requisite.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Falkirk Gas Commissioners have not yet been nine months in possession of the gas undertaking, yet in that short space of time they have revolutionized the gas manufacture in the town. No one would have expected the Company, as they existed, to have expended the money necessary to renovate the works. But, of course, had they obtained parliamentary powers, they would, without doubt, have made their works equal to all requirements. There was more reason to fear that the Corporation, on taking over the gas undertaking at a large price, would, in their inexperience of the conduct of such a business, grudge expenditure, and so lead to a continuance of the unsatisfactory condition of the works. This, however, has not been the case. The Commissioners have shown a remarkably business-like capacity; and they have been excellently advised by their Manager (Mr. P. B. Watson). The money which has been expended has been judiciously laid out; the Commissioners having been led to introduce two of the most profitable systems which exist at present. They showed the excellence of their judgment in the selection of the right processes; and they have also displayed wisdom in the re-arrangement of the works, which will now be much simpler in design, and therefore easier worked. The Commissioners have accomplished all this with the assistance of their own Manager only, and without calling in a consulting engineer. This shows an amount of confidence in Mr. Watson on the part of the Commissioners which it is delightful to observe—more particularly when it is remembered that, at the time of his appointment, there appeared to be an unnecessary severity on the part of some towards him. It looked then as if the Commissioners would be apt to meddle too much with the management; but this has not resulted, with the consequence that there is mutual happiness. The proceedings on Tuesday last, when the new plant was brought into use, were of a most harmonious description.* The Commissioners have done right in putting the works in order at the beginning of their occupation of them, rather than attempting to go on with worn out and antiquated plant. With the saving of 11d. per 1000 cubic feet which is estimated to be derived from the working of the Hislop regenerative plant, they will at once begin to earn profit; and, if they choose, they should soon be in a position to reduce their capital. I observe that nothing was said about saving by the Peebles oil-gas process. In other places where it has been adopted, reductions to the amount of about 5d. per 1000 cubic feet have been effected. If at Falkirk they can do the same by the Peebles system, there will be, with the two processes, a saving of 1s. 4d. per 1000 cubic feet. That would be a splendid result, and would justify the action of the Commissioners in the fullest manner.

There is a feature about Tuesday's proceedings which strikes me as peculiar. Mr. Storey, who was the originator of the gas transfer, was not present. He recently resigned his membership of the Town Council and Gas Commission, and could not have attended in an official capacity; but there were others there whose connection with the gas undertaking was simply their connection with the transfer—notably Mr. A. Gardner, the Sheriff-Clerk Depute at Falkirk, who was Clerk in the arbitration, and Mr. T. Wilson, of Coatbridge, who was one of the valuers of the stock taken over by the Commissioners from the Gas Company. Mr. Storey's absence must therefore surely be accounted for upon some ground other than that of mere accident. What that ground is, I do not know; but it looks as if there had been serious difference of opinion between Mr. Storey and his colleagues.

The Commissioners, at a meeting on Monday, had before them an application by the Eastern District Committee of the Stirling County Council asking the terms upon which the mains would be extended, and gas supplied to about 150 additional lamps in the Larbert Special Lighting District. There is a healthy appearance about this; because it means probably about three miles of new mains in a populous district, and the certainty of a considerable demand for private lighting along the route. The subject is under consideration of the Manager. Provost Griffiths, who is an able public representative, referred to this application on Tuesday; and said that the county authorities would get the gas they wanted for public lighting at a price fixed upon the same principle as they charged for the public lighting within the burgh. Nothing could be fairer than that.

At the meeting of the Rothesay Town Council on Monday, the report of Mr. J. Ballantyne, the Gas Manager, showed that in the month of September there was an increase in the consumption of gas in the burgh, as compared with the same month of last year, of 14 per cent.; and that there are now 307 gas-cookers in use, compared with 262 at this time last year. With a business growing like this, the works are rapidly becoming much too small; and the Town Council have now obtained the sanction of the Dean of Guild Court for the alterations which they propose to make upon the buildings they have acquired for new works. Plans for the works, which have been prepared by Mr. A. Gillespie, of Glasgow, were before the Council, and were approved; the Committee being instructed to advertise for offers for the whole of the work. One of the members asked if there would be any smoke from the chimney at the new works; and Mr. Ballantyne assured them there would not. Another asked if there would be any smell, to which Mr. Ballantyne replied that there must always be a smell, but that it would be much less than at present. A third member, who interested himself in the purifiers, elicited the information that in the new works, instead of having to change the purifiers every three or four days as at present, they would go for about three weeks in the winter season.

The Directors of the Coatbridge Gas Company, at a meeting on Tuesday of last week, reduced the price of gas from 3s. 4d. to 2s. 11d. per 1000 cubic feet, from and after Jan. 1 next. The gas supplied by the Company is of 23 to 25 candle power; and the price is thus extremely moderate. Coatbridge is very favourably situated for coal supply, which is a great help to the production of cheap gas; the other most favourable element tending in that direction being the good management of Mr. T. Wilson. Many gas managers will envy the Company's position, when they learn that the Directors have just

* A report of these proceedings will be found on p. 834.—Ed. J. G. L.

concluded contracts for a six months' supply of coal at the average price of 6s. 2d. per ton.

An action relating to the accuracy of a gas-meter was heard in the Hawick Sheriff Court on Wednesday. The Hawick Gaslight Company sued W. Oliver, cashier, for £1 14s., as the price of 13,600 cubic feet of gas consumed since September, 1894. The defence was that the quantity of gas charged for had not been consumed. The Company led evidence to show that the defender's meter, when taken out and tested, was found to be perfectly accurate; also that there was a strong smell of gas, and that Mrs. Oliver was warned that there was something wrong with the gas-pipes in the house. For the defender, evidence was given to the effect that they only burned gas for a fortnight during the period charged for. The Sheriff could not, of course, take such evidence into account, but said he had to abide by the reading of the meter. There had unfortunately, he added, been something wrong with the pipes in the house, with which, however, the Gas Company had nothing to do. He gave decree for the sum sued for, with expenses.

The Paisley Gas Corporation have been considering a report by their Manager (Mr. George R. Hislop) upon experiments made by him with Welsbach incandescent gas-burners, and inquiries he had made into the question of their suitability for public lighting. As a result, they have instructed that the lamps in front of the Municipal Buildings be fitted up, as an experiment, with Welsbach burners consuming 3½ cubic feet per hour. A movement is on foot in the Corporation for the abolition of meter-hire charges; notice of motion having been given for the appointment of a Committee to inquire and report as to the best arrangement for the purchase by the Corporation of all gas-meters not at the present time owned by them, as a preliminary to dealing with meter-rents.

The Perth Gas Commission met on Thursday night, to consider as to the filling up of the vacancy in the gas managership. They had first considered the subject in Committee, when it had been moved (1) that they advertise for a manager at a salary of £300; (2) that Mr. Easson, the present Assistant Manager, be appointed at a salary of £200; and (3) that the post be advertised at a salary of £250. The second motion had been withdrawn; and on a division, it had been agreed, by 11 votes to 6, to recommend in terms of the first motion. Lord Provost Dewar moved the recommendation in the Commission. He pressed upon the members that they must get the best possible man. He had taken some trouble to ascertain the salaries of gas managers over the country; and he did not think that any of them could be moved for less than £300—he meant a man who was capable of looking after the management, construction, and erection of the new works. The late Manager had £365; and they would be offering, in £300, less than Mr. Whimster had thirty or forty years ago. They ought to have a man who was capable of drawing plans and making up specifications. If they employed an outsider, he would charge 7½ per cent. commission; and they would spend on his fee alone forty years of the difference between £250 and £300. That the salary be £250 was moved by Mr. Keiller, who thought it was just as possible to get a competent man for £250 as for £300. He asked how many managers in Scotland had experience in the construction of gas-works. He questioned if there were three or four. One member thought they would get a man for £250 who would be good enough for Perth. Another thought they could get the best man in Scotland for £300. Several of the members spoke in favour of Mr. Easson; and among these Mr. Wright, who said he thought that they should give him an interim appointment for a year, as an opportunity to win his spurs. One remarked that they wanted a man with a college training, who had studied chemistry and engineering; and they would not get such a man for £250. Such is the interest taken in the subject that, out of 23 members present, 22 of them spoke. On a division, 15 voted for the Provost's motion, 6 for a salary of £250, and 2 members declined to vote. The salary offered will therefore be £300. The appointment of a Manager for the gas-works is, as was said, a most important proceeding; and the Commissioners do well to endeavour to secure the services of a good man. They are in a very delicate position, however, with reference to Mr. Easson. Little more than a year ago, it will be remembered, Mr. Easson applied for the post of Manager of the Forfar Corporation Gas-Works; and the Perth Gas Commissioners met hurriedly, and advanced his salary in order to retain his services. No one can say that Mr. Easson has a claim to the post; but he has a strong claim to consideration, whether he gets the position or not. If he does not get it, the Commissioners will be open to the reproach that they served themselves at the expense of his prospects.

Haverfordwest Water Supply.—A special meeting of the members of the Haverfordwest Town Council was held on Monday last week, for the purpose of receiving the report of Mr. F. Beesley, M.Inst.C.E., on a scheme by which it is proposed to take water into the town by gravitation in the place of the present pumping scheme, which has caused much dissatisfaction during the six years of its existence. The report stated that, in company with the Borough Surveyor (Mr. Gibbon), Mr. Beesley visited the source of the springs at Little Newcastle on the 10th and 11th ult., when he found the yield 136,000 gallons in 24 hours, and this after a period of very dry weather. The population of Haverfordwest is about 6200; and, making the usual provision of 20 gallons per head, 124,000 gallons per day would be required. It would therefore be seen that, even during exceptionally dry weather, the springs, after opening out, would yield sufficient for the town for some time to come; and this could be increased in future by constructing a large storage reservoir. He proposed for the present to build an open reservoir at the source, to hold two days' supply. The length of the new main would be about 10 miles; and he estimated the cost at a total of £8500, which, after deducting the present annual expenses of pumping, represented an annual extra outlay for the gravitation scheme of £150 9s. This scheme could consequently be carried out for an additional 2d. in the pound on the present rateable value of the borough—£18,068. The meeting expressed great satisfaction with the report; and it was resolved, on the motion of Mr. R. T. P. Williams, by whom the scheme was first introduced, to adopt it, and at once take the necessary steps for carrying it out.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 19.

Sulphate of Ammonia.—The better demand noticed in the last report continues; but the buying has, for the most part, been to cover sales previously made. Consumers have not responded to any great extent, not believing in any substantial advance in the price of sulphate of ammonia, in face of the low price of nitrate of soda, and other nitrogenous material, for both prompt and forward delivery. They would be interested in the forward position, if at a moderate premium; but makers do not seem inclined to commit themselves far ahead, unless at a substantial advance on prompt prices. For delivery over spring months, a fair quantity was recently sold at up to £9 7s. 6d. per ton f.o.b.; but quotations have advanced to a point beyond the ideas of buyers. Prompt quotations are £9 to £9 2s. 6d., f.o.b. at the ports.

Nitrate of Soda is very quiet in all positions. On spot, the value of fine quality is 7s. 9d. per cwt.; and cargoes of ordinary quality, autumn shipment, may be had at about 7s. 7½d. per cwt.

LONDON, *Oct.* 19.

Tar Products.—Pitch remains steady at prices ranging between 35s. 6d. and 38s., according to port of shipment. The prospect of continuing these prices for the present season appears now to be pretty well assured, although dealers still declare that fuel makers cannot afford to pay present prices, and, if the prices are kept up, large briquette makers will cease operations. Such reports have been circulated before; but fuel makers still go on. Carbolic acid is in excellent request. Although crude does not advance in price, there is a ready market for it; and crystals are dearer in proportion than crude—the first time for many years such a disparity has existed. Benzols have suddenly acquired better values. Whether they will continue to improve is quite a matter for speculation. Anthracene is held firmly at prices quoted below, though a determined and nefarious effort has been made to depress the article, and to discredit the Anthracene Committee. Fortunately, the Committee are strong enough to resist such futile attacks. Values for the week are as follows: Tar, 19s. to 22s. 6d. Pitch, 35s. 6d. to 38s., according to port of shipment. Benzols, 90's, 1s. 3d.; 50's, 1s. 2d. Solvent naphtha, 1s. 2d. Toluol, 1s. 3d. Crude, 30 per cent., naphtha, 5d. Naphthalene salts, 25s. to 40s., according to quality. Cresylic acid, white, 1s. 2d.; brown, 10½d. Carbolic acid, 60's, 1s. 6d.; 75's, 1s. 9½d. Anthracene, "A," 1s.; "B," 9½d.

Sulphate of Ammonia has steadily gone on improving the last two weeks. It looks as if "bear" operations have now ceased; and sulphate will be allowed to assume its proper position in relation to nitrate of soda. Transactions have taken place during the week at from £8 15s. to £9 2s. 6d.; sellers now demanding £9 5s., less 3½ per cent., at all ports. Gas liquor is quoted at 7s. to 8s.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Some improvement is beginning to manifest itself in the coal trade here; the demand for house coal necessarily showing more activity with the approach of winter, while the common qualities of round coal are in better request for manufacturing purposes—especially those descriptions suitable for iron-making requirements. Pits here and there are securing sufficient orders to enable them to work practically full time; but four days per week is still about the average, with supplies ample. Prices show no improvement, except that where they were previously cut below current quotations, they have now been levelled up to list rates. At the pit mouth, best Wigan Arley remains at about 10s. to 10s. 6d. per ton; Pemberton four-feet and seconds Arley, 8s. 6d. to 9s.; common house coal, 7s. to 7s. 6d.; and steam and forge coal, which continue very low in price, average 6s. to 6s. 6d. Notwithstanding the increased output of slack, engine fuel moves off fairly well. Prices are well maintained, ranging from 3s. and 3s. 6d. for common, to 4s. 6d. and 5s. per ton for better qualities at the pit mouth. In the shipping trade, there is no improvement to report; business is still coming forward only in very limited weight, with prices quite as low as ever. Common steam coal can be readily bought at about 7s. to 7s. 6d., with better qualities quoted 7s. 9d. to 8s. per ton, delivered at the High Level, Liverpool, or the Garston Docks. It is reported that two Lancashire colliery firms have secured 80,000 tons of the Belfast contract, and that a Yorkshire firm, who last year supplied a large quantity, have not succeeded in securing any portion of the contract this season. The two Lancashire colliery firms above referred to are the Wigan Coal and Iron Company, who have contracted for 30,000 tons; and the Abram Coal Company, who are to have 50,000 tons. There are various statements as to the prices at which these contracts have been placed; but they are too indefinite for repetition beyond the statement that the prices are the lowest ever quoted.

Northern Coal Trade.—The coal trade has now entered upon a period of rather irregular output and shipment; the stormy weather affecting naturally the arrival of steamers, and thus the working of the collieries that depend on the sea for any considerable part of their output. The Northumbrian steam coal trade therefore varies a little from day to day, chiefly in the extent of the demand, but also a little in the price. Generally, best steam coals are quoted at 8s. 6d. per ton f.o.b.; but in cases where there is pressure to get vessels away, 1½d. per ton more may be asked. Second-class steam coals are quiet, at from 7s. 10½d. to 8s. 3d. per ton f.o.b. Small steam coals are quoted 3s. 9d. to 4s. per ton. There is only a moderate business in household coal; and for shipment the price that is quoted varies from 10s. to 10s. 6d. per ton f.o.b. Gas coal is now naturally in greater demand; and the increase must be expected to continue until the end of the year. While the price that is quoted for best Durham gas coals may be given as about 6s. 9d. per ton f.o.b., yet there are some coalowners well sold forward who ask as high as 7s. 3d. for their produce. The local demand for gas coal seems to increase; and there is a desire on the part of many gas companies to enlarge their stocks. Some of the great gas companies are taking advantage of the low freights that have prevailed to get in stocks prior

to the time when higher freights may be concurrent with larger consumption. There is not so much alteration in the coke trade. The demand is steady; and the price is well maintained. Best Durham coke is quoted from 13s. 6d. to 14s. 6d. per ton for export; while the local consumption is large, and the price is about 12s. 9d. to 13s. 3d. per ton, delivered at the local blast furnaces. There is no alteration in the price of gas coke; but with an increased production, some gas companies find it a little more difficult to keep down their stocks.

Scotch Coal Trade.—Over-production is paralyzing the coal market in Scotland. There is a large quantity of coal changing hands; but the supply is more than equal to the demand, and is likely to remain so, with the result that no advance can be got in prices. Ell of the best quality is about the only variety which is in anything like demand equal to output. Other varieties are being stacked; and the market is dull. The prices quoted are: Main, 5s. 9d. to 6s. per ton f.o.b. Glasgow; ell, 6s. 9d. to 7s.; splint, 6s. 3d. to 6s. 6d.; and steam, 7s. 6d. to 7s. 9d. The shipments for the week amounted to 163,482 tons—an increase upon the quantity in the preceding week of 6505 tons, and upon the quantity in the corresponding week of last year of 116,226 tons. For the year to date, the total shipments have amounted to 5,773,551 tons—an increase over the quantity in the same period of last year of 1,912,043 tons, and a decrease on the corresponding period of 1893 of 308,401 tons.

Devonport Water Supply.—Some important works for the improvement of the water supply of Devonport are approaching completion. Considerable additions and alterations have been made to the reservoir at Crownhill, and a new reservoir near the village of Roborough is now nearly finished. This reservoir, which will be called Belliver, is 500 feet above the sea-level, and will have a capacity of 2,000,000 gallons. It is 210 feet in length, 140 feet in breadth, and 11 feet deep. The walls are of concrete, faced with brick; the bottom also being of concrete covered with asphalte. A main has been laid from it to the one at Crownhill, and this will do away with the open leat previously existing, and lessen to this extent the risk of pollution and of the water being frozen in winter. The cost of the Belliver reservoir has been about £8000. A similar amount has been expended on the main, and about £6000 in the additions and alterations to the Crownhill reservoir. The work has been carried out from the plans and under the superintendence of Mr. H. Francis, the Engineer to the Devonport Water Company. The scheme was provided for by Act of Parliament, and additional stock was issued to cover the cost. The capital was subscribed for several times over; the average price obtained for the 4 per cent. stock being a little over 122.

St. Ives Corporation and the Gas-Works.—An inquiry was held at St. Ives (Cornwall), on Thursday, by Colonel A. G. Durnford, R.E., representing the Local Government Board, respecting the application of the Town Council for power to borrow £6000 for the purchase and extension of the gas-works. The Town Clerk (Mr. Boase) said Mr. J. W. Buckley, Gas Engineer, of Falmouth, whom the Corporation had consulted, recommended that the loan should be £6500; and the Corporation asked for a period of not less than 35 years for its repayment. The Corporation bought the plant, &c., for £235; and took possession of the works on Aug. 15, 1894. The land was purchased for £2000. The plant, mains, &c., were very dilapidated and inadequate; and the price of gas hitherto has been prohibitive. The Corporation hoped to give a much better light at a less price. Mr. Buckley stated that two contracts had been entered into for extending the works. One for £2000 included retorts, retort-benches, hydraulic main, scrubber, engine and exhausters, purifiers, meter and governor, and a new gasholder—the last named having a capacity of 39,000 cubic feet. The second contract was for £1000, which included the building of a new retort-house. The Corporation were not absolutely committed to the £6500; but in recent years gas companies and corporations had found it advisable to put in services and fix meters free of cost, and this policy would be an inducement for the consumer to have the gas laid on. The new works would be capable of making 10 million cubic feet of gas per annum. He believed that with judicious management the works would not only be self-supporting, but would hand over a handsome profit to the rates. At the close of the inquiry, Colonel Durnford visited the works.

Common-Sense in the Use of Gas.—This was the title of a lecture delivered by Mr. C. Nickson, the Superintendent of the Manchester Corporation Gas Department, before the Hulme Healthy Homes Society last Thursday. Illustrating the lack of common-sense often exhibited, he quoted a number of typical cases of complaint, in each of which the charge as to deficiency in the quantity or quality of the gas had its origin in neglect on the part of the consumer. The consumers in the city number nearly 85,000; and although it was sometimes said that everybody was complaining of the gas, the complaints sent in to the office only reached about 8000 annually, or 9 per cent. of the whole number of meters in use. It was sometimes said that the official answers to complaints were stereotyped, and so they were, simply because the complaints were stereotyped. Special complaints always received careful attention and a special reply. Proceeding to show how common-sense might be exercised, he referred first to the meters. The size of these, he said, should be regulated by the number of burners and other appliances in use. It was desirable that the meter should be too large rather than too small—a large meter could be turned off according to requirements; whereas a small meter, worked beyond its capacity, was apt to register unfairly, and to be inconvenient in its operations. As to burners, he advised that people should beware of the man who went from house to house hawking burners that were inferior in quality and higher in price than could be obtained at any gas-fitter's for a penny. When good burners were obtained, care must be taken to keep them free from corrosion. With regard to globes, he said that the ordinary globes with narrow bottoms were undesirable, as they created a forced draught, which caused the flame to flicker, curl up, and smoke. Opal, ground glass, and other such globes much reduced the quantity of light; and an excellent form of globe was that which consisted of opal or ground glass in the upper part and clear glass at the bottom. Gas was a good servant; and it would well repay good usage in these and other directions.

New Joint-Stock Companies.—The following new joint-stock companies have lately been registered: The Elstree and Boreham Wood Gas Company, Limited, with a capital of £20,000, in £10 shares, to manufacture and supply gas in the parishes of Elstree, Aldenham, Shenley, and Ridge, in Hertfordshire, and elsewhere. Wright's Gas-Meter Syndicate, Limited, with a capital of £100,000, in £1 shares, "to acquire the interest of F. Wright in patents for all parts of the world, except Great Britain and her colonies and dependencies, but including patents for Canada, for inventions dealing with gas-meters, coin-freed meters, dry gas-meters, &c.; and to carry on the business of prepayment and other gas-meter manufacturers, mechanical engineers, gas engineers, &c., in all its branches." The West Australian Electrical Trunk Power and Lighting Company, Limited, with a capital of £510,000, in £1 shares (10,000 deferred), to carry on, in West Australia and elsewhere, the business of an electric supply company in all its branches; and also those of a gas and water supply and a mining, milling, and smelting company.

Serious Accident at the New Water-Borings for Leamington.—An unfortunate accident has occurred in connection with the water-boring operations of the Leamington Corporation near their supplemental reservoir at Lillington. The Contractor (Mr. Vickers) has sunk a shaft 8 feet in diameter to a depth of 83 feet, having to go but 7 feet farther to finish the first portion of the contract. The ordinary protection of timber was used for casing the well, in sinking which the excavators passed through clay, marl, and sand; the latter being unpleasantly conspicuous, but no danger was feared. Just as the men were leaving work a few days since, the whole well collapsed. Happily no one was in the shaft at the time; but the Contractor's plant is buried, and the Corporation have lost their money. The shaft is so near the reservoir, that it became essential forthwith to fill up the portion not covered with *débris*, in order to make the reservoir secure. The bore never touched the water-bearing rock which the authorities believed to be near at hand. It is intended to sink a second shaft at a greater distance from the reservoir; and special precautions will be taken to cope with running sand, which is prevalent in the locality of the well.

The Price of Gas in the Rochdale Out-Districts.—At the last meeting of the Castleton District Council, the Clerk read a letter from the Deputy Town Clerk of Rochdale with reference to the price of gas. It stated that the Gas Committee would be glad to receive a deputation from the Council; but if the sole object of the deputation was to secure a reduction in the price of gas, it might possibly save trouble to state that the Committee considered the present price of gas very reasonable, and would strongly object to making any change at present. The Chairman (Mr. S. W. O'Neill) said he believed the Council were under a misapprehension at the time they appointed the deputation. Mr. Holt said the Council were certainly under the misapprehension that the price of gas had not been lowered since the reduction in the price of coal; but notwithstanding that, he thought it was quite time an attempt was made to get the charge reduced from 3s. 4d. per 1000 cubic feet. When he could name places where the gas was sold at 2s., 2s. 3d., and 2s. 4d., he thought it was quite time that Rochdale, with its improved apparatus and its close proximity to the coal-fields, should make a reduction. Mr. Ormerod suggested that the Clerk should write to the other Councils supplied by the Rochdale Corporation, asking them to join in a strong deputation to the Gas Committee with a view to getting the price reduced. The Chairman thought this proposal a good one. It was decided that the Clerk should write to other local authorities, asking them to join in the deputation.

Water-Works Improvements at Exeter.—The Water Committee of the Exeter City Council have arrived at the conclusion that the time has come when an increased supply of water is absolutely necessary, and some improvements are required in the filtration system. Upon the Committee's instructions, the Surveyor has reported upon the question. He estimates that the demand for water 30 years hence will be 2,550,000 gallons per day, or an increase of about 750,000 gallons daily on the present maximum demand. The total filtering area required is 70,000 feet; and, there being no land in the vicinity of the reservoirs where filter-beds of this area could be constructed, he suggests that new beds be formed at Pynes, where the Council would have to acquire only one additional area of land. His estimates for the different items are as follows: Filter-beds, &c., Pynes, £5500; engine at Pynes, £850; two boilers, £750; alterations to house, &c., £300; rising main, £4295; taking up and relaying 10-inch main, £325; new engine and boiler at Dane's Castle, £1125; intermediate reservoir, £2600; extensions, £500—total, £16,245. The alterations would bring about a reduction of the cost of working of between £100 and £150 a year; but the main gain would be a plentiful supply of properly filtered water. The Surveyor also suggests direct pumping from Pynes to an intermediate reservoir, and the transference of the whole pumping to Pynes. This, he believes, would result in a saving of 50 per cent. on the present coal bill. In conclusion, he states that it is his opinion that it would be worth while to consider what could be effected by having the principal pumping-station under the same roof as the electric light works, for the purchase of which the Corporation have entered into a conditional agreement. Referring to the use of the city refuse for raising steam, the Surveyor points out that, while it would not be possible to take the refuse to any of the pumping-stations, no such objection could be raised against bringing the water in a closed conduit to be pumped at a place where the sifted refuse could be used. A new 15-inch supply main from Pynes to Exe Street would have to be provided in conjunction with the existing 12-inch main, involving an additional outlay not exceeding £1000. Instead of suggesting the construction of a destructor, he recommends the making of producer gas; but such a scheme as this, he says, would need further consideration. This, however, need not delay the construction of the filters, the laying of the direct main, or the re-arrangement of the machinery for the new supply. The matter came before the City Council last Wednesday, when Mr. Fulford moved that the Committee be authorized to obtain opinions from experts upon the suggestions made by the City Surveyor. If, he remarked, the proposals were adopted, they would involve a total expenditure, with land, &c., of £20,000 or £22,000. The motion was passed.

Rhyl Water Supply.—In consequence of the rapidly-increasing summer and winter population of the Rhyl district, the Urban District Council have decided to take steps to increase the delivery of water from their reservoir. Mr. F. Storr, of Wrexham, who has been consulted, recommends them to lay a new 8-inch main from the bottom of the hill on which the reservoir is situate to the elevated ground just outside Rhyl, with a new 12-inch main from the latter point to the centre of Rhyl; also to construct an elevated tower so that a pressure of 80 feet may at all times be given at Rhyl. It is estimated that a 9-inch main will cost £4750; a 10-inch one, £6110; and the elevated tower, about £2500. With an ever-increasing population, it is also felt that an additional reservoir for storage purposes will have to be built.

Sales of Shares.—Messrs. Grimley and Son recently sold by auction, at Redditch, 60 lots of ten £10 preference shares in the *Redditch Gas Company;* the total amount realized being £7520 15s. 6d.——Last Tuesday, Messrs. Nicholson, Greaves, Barber, and Hastings sold at Sheffield 15 £1 shares in the *Eckington and Mosbro' Gas Company, Limited,* for £2 2s. each.——Last Wednesday, Mr. R. Mack sold by auction £10,000 of 3½ per cent. debenture stock in the *Newcastle and Gateshead Gas Company;* being part of the money authorized to be borrowed under their Act of 1879. There was a large number of bidders; and the whole of the stock was rapidly disposed of. The top price obtained was £116 7s. 6d. per cent.; and the lowest £116—the average being £116 2s. 1½d. The total realized was £11,610 12s. 6d.——Yesterday week, £65 of 7 per cent. new ordinary stock in the *Scarborough Gas Company* was sold by auction at the rate of £167 per cent., and £150 of similar stock realized £164 per cent. These prices were stated by the Auctioneer to be the best ever recorded for this stock.

Northam Water Supply.—Mr. Baldwin Latham, M.Inst.C.E., has forwarded to the Northam District Council the plans and estimate of his scheme for supplying water for Northam, Appledore, and Westward Ho, from Abbotsham, to which reference was made in the JOURNAL for the 1st inst. The scheme, the report said, was decidedly the best that could be devised. There was a gathering-ground of 120 acres, with 40 acres extra; and the reservoir would contain 22 million gallons. About 15 miles of cast-iron main would be required; and there would be storage for a supply of 170,000 gallons per day. The cost of the works would be £18,598; and engineering and other expenses would bring up the amount to £22,300. Assuming there was formidable opposition—which Mr. Latham did not anticipate—and that the whole of the works would cost £25,000, including parliamentary expenses, if this amount were borrowed for sixty years, an annual sum of £903 would be required to pay principal and interest. The cost of working the pumping-engine and for filtration, turncock, &c., would be £150 a year. An alternative scheme was a supply from Yeo Vale by pumping; but that would be the more costly. The matter came before the Council at their last meeting; but the cost of the scheme frightened the members, some of whom seemed to think a supply of water might be found at Appledore for that town. In the result, the question was deferred.

Welsh Water for Wales.—At a meeting of the Water Committee of the Glamorgan County Council last Thursday, the Clerk (Mr. T. M. Franklen) reported that the County Councils of Breconshire, Carmarthenshire, and Monmouthshire had been invited to unite with the Glamorgan Council in considering the question of the water supplies of the four counties; but no replies had then been received. Some conversation took place as to what further action should be taken in the way of forming an area; it being suggested that this should be as large as possible, and in the direction of opposing the London County Council Bill to take water from Wales, if it were to be promoted next session. Mr. R. Middleton and Mr. J. A. B. Williams were appointed Engineers to report on the matter; and the Clerk was instructed to write to the Councils named, informing them of what was intended to be done, and that the preliminary expenses would be paid by Glamorgan. The Clerk was also directed to inquire whether the Engineers should deal with the other counties, and to request the Councils to appoint Committees to confer on the subject with the Glamorgan Committee. The Clerk read letters from the Welsh Members of Parliament, who expressed sympathy with the movement, their approval of a Royal Commission being appointed to protect the water supplies of Wales, and their readiness to attend a meeting to be held soon for the special purpose of considering the question.

The Ilfracombe District Council and the Gas-Works.—On the recommendation of the General Purposes Committee, the Ilfracombe District Council have decided not to proceed further with the proposal to promote a Bill for the compulsory purchase of the Gas Company's undertaking. The Surveyor is, however, to report upon the advisability and cost of supplying the town with electric light.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 832.)

Issue.	Share	When ex-Dividend.	Dividend on Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	24–25½	..	4 4 0
100,000	10	,,	7½	Do. 7 p. c.	10	16–17*	..	4 8 3
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	107–109	..	4 11 9
200,000	5	1 May	6¾	Bombay, Limited	5	7¼–7¾	..	4 3 10
40,000	5	,,	6¾	Do. New	4	5¼–5¾	..	4 10 3
380,000	Stck.	14 Aug.	12	Brentford Consolidated . .	100	253–258	..	4 13 0
180,000	,,	,,	9	Do. New	100	205–210	–2	4 5 8
220,000	Stck.	27 Sept.	11	Brighton & Hove Original	100	222–227	..	4 16 10
933,500	Stck.	29 Aug.	5	Bristol	100	125–130	..	3 16 11
320,000	20	27 Sept.	11¼	British	20	54½–55¾	+¼	4 1 1
50,000	10	29 Aug.	11¼	Bromley, Ordinary 10 p. c.	10	22¾–23¾	+1	4 17 10
51,510	10	,,	8¾	Do. 7 p. c.	10	18–19	+1⅛	4 9 5
328,750	10	12 June	4	Buenos Ayres (New) Limited	10	8¾–9¼	+¼	4 6 6
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	102–104	+½	5 15 5
150,000	20	11 July	8½	Cagliari, Limited	20	31–33	..	5 0 0
550,000	Stck.	26 Oct.	13½	Commercial, Old Stock . .	100	300–305*	+1¾	4 8 6
165,000	,,	,,	10½	Do. New do. . . .	100	223–228*	+3¼	4 12 1
160,762	,,	12 June	4½	Do. 4½ p. c. Deb. do.	100	143–147	..	3 1 3
800,000	Stck.	12 June	13	Continental Union, Limited.	100	280–285	..	4 11 3
200,000	,,	,,	10	Do. 7 p. c. Pref. .	100	215–220	..	4 10 11
535,000	Stck.	29 Aug.	5¼	Crystal Palace Ord. 5 p. c. Stk	100	125–130	..	4 0 9
486,090	10	26 July	11	European, Limited . .	10	25½–26½	+½	4 3 0
351,060	10	,,	11	Do. Partly paid	10	17–18	..	4 14 3
5,646,590	Stck.	14 Aug.	12¾	Gaslight & Coke, A, Ordinary	100	294–296	..	4 5 6
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	107–112	..	3 11 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	282–287	..	3 9 8
30,000	,,	,,	5	Do. F, 5 p. c. Prf. .	100	135–140	..	3 11 5
60,000	,,	,,	7½	Do. G, 7½ p. c. do. .	100	200–205	..	3 13 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max. .	100	193–198	..	3 10 9
463,000	,,	,,	10	Do. J, 10 p. c. Prf. .	100	282–287	..	3 9 8
476,000	,,	,,	6	Do. K, 6 p. c. Prf. . .	100	167–170	..	3 10 7
1,061,150	,,	12 June	4	Do. 4 p. c. Deb. Stk.	100	135–140	..	2 17 2
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	145–150	..	3 0 0
908,000	,,	,,	6	Do. 6 p. c. do.	100	202–207	..	2 17 11
3,800,000	Stck.	10 May	12	Imperial Continental . . .	100	247–252	–1	4 15 3
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	6–6½	+¼	4 12 4
560,000	100	1 Oct.	5	Met.of Melbourne, 5 p.c. Deb.	100	113–116	..	4 6 2
541,920	20	12 June	5	Monte Video, Limited . .	20	18–19	..	5 5 3
150,000	5	24 May	8	Oriental, Limited	5	7¼–7¾	..	5 3 2
60,000	5	12 Sept.	7	Ottoman, Limited	5	5–5⅛	..	6 7 3
166,870	10	14 Feb.	2	Para, Limited	10	1¾–2⅛	..	8 0 0
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds. . . .	100	108–112	..	5 7 1
500,000	100	4 June	6	2nd Do. . . .	100	102–107	..	5 12 1
150,000	10	16 Oct.	7	San Paulo, Limited . . .	10	11½–12¾*	+⅛	5 12 0
500,000	Stck.	29 Aug.	15½	South Metropolitan, A Stock	100	370–375	..	4 2 8
1,350,000	,,	,,	12	Do. B do. .	100	310–315	..	3 16 2
308,685	,,	,,	13	Do. C do. .	100	325–330	..	3 18 9
800,000	,,	11 July	5	Do. 5 p. c. Deb. Stk.	100	175–178	+1	2 16 2
60,000	Stck.	12 Sept.	11½	Tottenham & Edm'nton, "A"	100	230–235	..	4 17 10
				WATER COMPANIES.				
746,021	Stck.	26 June	10	Chelsea, Ordinary . . .	100	293–298	..	3 7 1
1,719,514	Stck.	16 Oct.	7	East London, Ordinary . .	100	223–228*	+4	3 1 5
651,740	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	157–162	..	2 15 6
700,000	50	26 June	7	Grand Junction	50	118–122	..	2 17 5
708,000	Stck.	29 Aug.	12	Kent	100	307–312	..	3 16 11
1,043,800	100	26 June	7½	Lambeth, 10 p. c. max. .	100	260–265	..	2 16 6
406,200	100	,,	7½	Do. 7½ p. c. max. .	100	208–213	..	3 10 5
330,000	Stck.	27 Sept	4	Do. 4 p. c. Deb. Stk. .	100	143–148	..	2 13 4
500,000	100	14 Aug.	12⅜	New River, New Shares . .	100	385–395	..	3 2 9
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk. .	100	143–148	..	2 14 2
902,300	Stck.	12 June	4	S'thwk & V'xhall, 10 p.c. max.	100	147–152	..	2 12 7
126,500	100	,,	4	Do. D 7½ p.c. do.	100	140–145	..	2 15 2
1,155,066	Stck.	12 June	10	West Middlesex	100	293–298	..	3 7 1

*Ex div

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director,
Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works

ANDREW STEPHENSON,
182, GRESHAM HOUSE,
OLD BROAD STREET,
LONDON, E.C.

Telegrams: "Volcanism, London."

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON,

Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also Improved Patent Rotary Scrubber-Washers.

*** See Advertisement p. II., centre of JOURNAL.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited,

Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality.

Sample and Price on application.
OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

GWYNNE & BEALE'S
PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

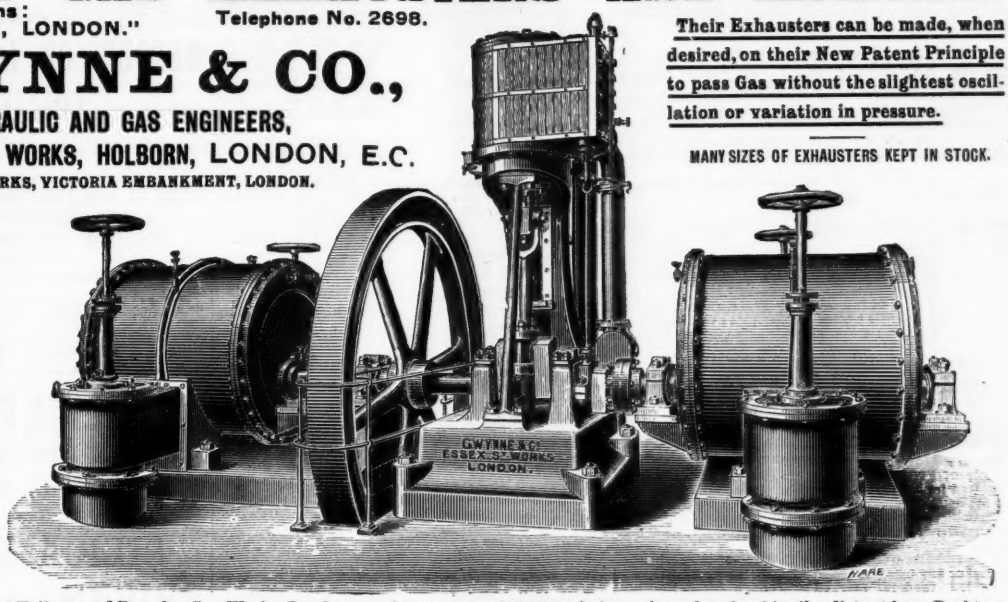
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.
BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

GOLD MEDAL, 1892.

TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See p. II., centre of last issue.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

BACK-PRESSURE IN PURIFIERS.

THE Valve invented by Mr. Cripps for Bye-Passing any Layer of Purifying Material (referred to by the President of the Incorporated Institution of Gas Engineers in his Inaugural Address) can be obtained of the Makers: C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP, and J. EVERY & SON, Phœnix Iron-Works, LEWES, to which Firms all inquiries should be addressed.

WANTED, a Position of Trust in Sec- retary's or Works Office of a Gas Company.
Address No. 2573, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SITUATION wanted in Gas-Works as STOKER or SULPHATE OF AMMONIA MAKER. Certificated for Engine Driving, and fair Fitter. Good References.
Address E. J. SARGENT, 63, Byrne Road, Balham, LONDON, S.W.

WANTED, a Position as Foreman in large Gas-Works or MANAGER. Experienced in general construction of Coal and Carburetted Water-Gas Plants.
Address No. 2584, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN desires Situation in Gas-Works. Ten years' experience in Gas-Works Plant, including Regenerator Settings and Stoking Machinery. Honoursman in Gas Manufacture. References given.
Apply, by letter, to No. 2581, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS, MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS, MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office MIDDLESBROUGH. Correspondence invited.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.
Before placing Orders, please write for Estimate.

GENTLEMAN, covering West of Eng- land and South Wales, with good connection among Gas Managers, is open for a COMMISSION.
Apply, by letter, to No. 2578, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a married Man, a Situa- tion as MANAGER of a small Gas-Works; also Boiler and Engine work. Willing to make himself generally useful. Eleven years' good Reference.
ELDERFIELD, Stoke Court, STOKE POGES.

WANTED, a Situation as Junior Gas- FITTER. Used to Iron and Compo. Fitting, laying Mains and Service-Pipes, &c.
For further Particulars, address No. 2577, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ASSISTANT Manager (Gas and Water) desires RE-ENGAGEMENT. Ten years' experience. Thoroughly practical and economical Carbonizer. Excellent Testimonials.
Address No. 2579, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a thoroughly good Mechanic as WORKS FITTER for Suburban Gas-Works. Must be well acquainted with the fitting of Cast and Wrought Iron Pipes, fixing of Mouthpieces, and all Retort-House Work. Constant employment to a suitable Man.
Apply, by letter, stating Age and Experience, with Character, to No. 2582, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

THE Undersigned is in a position to supply, at the very lowest Prices, the most suitable kind of BENZOL for enriching Gas, made from Hardman's Patent Carbonization Process, of which I am the Sole Patentee. On application, I would furnish Price on the most reasonable terms; giving advice how to utilize it on the most economical method.
J. HARDMAN, Manufacturing Chemist.
Milton, Staffs.

TO ENGINEERS AND MANAGERS.

MR. J. L. FEATHERSTONE (late Chief Draughtsman to Humphreys and Glasgow) is prepared to supply complete WORKING DRAWINGS, SPECIFICATIONS, and QUANTITIES for WATER-GAS PLANT. Own design.
Also DRAWINGS, TRACINGS, &c., of COAL GAS PLANT; Specially prepared for work wanted in a hurry. Moderate Charges.
Temporary Offices: 27, FORE STREET, E.C.

THE Advertiser, with wide connection among Gas Managers throughout the United Kingdom, is open to take up a SPECIALITY on very favourable terms, either temporarily or permanently. Can offer London Office in good situation.
Projectors of new Carburettors, Retorts, Incandescent Lighting Apparatus, and other Novelties in Gas Plant and Gas Lighting are invited to correspond with No. 2572, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-FITTER AND TINMAN.

WANTED, a competent Man as above. Wages, 30s. per week. Preference would be given to one having had experience in the Repair of Meters.
Applications, stating Age, with References as to character and ability, to be addressed to the SECRETARY and MANAGER, Gas-Works, FOLKESTONE.

WANTED, at once, an active young Man as MAIN and SERVICE LAYER (Gas and Water). One who can wipe Joints, do a little Plumbing, and competent to act as Water Inspector preferred.
Apply, with *copies* of Testimonials only, and stating Wages required, to Mr. F. RUSSELL, Gas-Works, BEXHILL.

PERTH GAS-WORKS.

APPLICATIONS are invited for the vacant office of GAS MANAGER.
Applicants to have a thorough knowledge of Gas Management and Manufacture in all Departments, and to be able to Design and Superintend any Alterations of Works that may be desired, as well as the Construction of New Works, if resolved on.
Salary, £300.
Testimonials to accompany the applications, which must be lodged with William MacLeish, Clerk to the Perth Gas Commissioners, on or before the 29th curt.
City Chambers, Perth,
Oct. 18, 1895.

WANTED, four or five dozen second-hand or new CROSS-BARS, SCREWS (square thread), SWING JOINTS, and LUGS.

Apply, by letter, stating lowest Price free on Rail, to No. 2583, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS ENGINEERS.

FOR SALE—A Reciprocating Pump EXHAUSTER, with Steam-Engine combined, by Dempster, of Elland, suitable for a Works with an annual make of 80 to 100 millions; the same being in first-class order, and may be seen on application to the undersigned, from whom any Particulars may be had.

J. B. FENWICK,
Gas and Water Engineer.

Retford, Not's.

FOR SALE, by Private Treaty, the BOTTESFORD GAS-WORKS, comprising Cottage, Retort-House, Purifying-House, Condenser, and Two Gasholders, with Tanks, and about 3 miles of Mains.

The Works are in full working order, supplying upwards of 600,000 feet of Gas per annum; and the Consumption can, with energetic management, be largely increased.

Apply on or before the 31st of October, 1895, to
WILLIAM W. WRIGHT.

11, Elmer Street, Grantham.

FIRE-CLAY GOODS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the supply of FIRE-CLAY GOODS (Retorts, Bricks, &c.), required for Repairs at their Neepsend and Effingham Street Stations during the next Twelve Months.

Specifications and Forms of Tender may be had on application to the Company's Engineer, Mr. Fletcher W. Stevenson.

The Directors do not bind themselves to accept the lowest or any tender.

Sealed tenders, marked "Tender for Fire-Clay Goods," must be delivered by post, addressed to the undersigned, not later than Saturday, Nov. 2 next.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
Oct. 5, 1895.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

SULPHURIC ACID.

THE Directors of the above Company are prepared to receive TENDERS for the supply of SULPHURIC ACID for a period of Three or Five Years, to be delivered, as required, at the Company's Sulphate Works, Dublin; the quantity being about 800 Tons per annum.

The Sulphuric Acid to be made from Spent Oxide, and to be of Specific Gravity 1750.

Tenders to be lodged at the Company's Offices on or before Tuesday, Nov. 5.

The Directors do not bind themselves to accept the lowest or any tender.

W. F. COTTON,
Secretary and Manager.

Offices: D'Olier Street, Dublin.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

SPENT OXIDE.

THE Directors of the above Company are prepared to receive TENDERS for the purchase of the SPENT OXIDE OF IRON produced on the Company's Works; the quantity being about 900 Tons per annum.

The Contract to be for Three or Five Years.

Specifications, giving Particulars of Sale, and the nature of the proposed Contract, can be had on application to the undersigned, at the Company's Offices, D'Olier Street.

Tenders to be lodged at the Company's Offices on or before Tuesday, Nov. 5.

The Directors do not bind themselves to accept the highest or any tender.

W. F. COTTON,
Secretary and Manager.

Offices: D'Olier Street, Dublin.

ARCHITECTS and Surveyors' Hand-book of GAS-FITTING TABLES and TESTS, by A. H. CRUMP. *Price* 6d.

JAMES STOTT AND CO., 174, Fleet Street, LONDON, E.C.

TO FIRE-BRICK MANUFACTURERS AND RETORT SETTERS.

THE Mossley Gas Committee invite TENDERS for the FIRE-CLAY MATERIALS and all LABOUR required in Building Regenerative Furnaces, Retort-Benches, and Retort-Settings.

The Drawings and Specification may be seen on application to Mr. Merrell, Manager, Gas-Works, Mossley, and at the Offices of Messrs. Thomas Newbigging and Son, 5, Norfolk Street, Manchester. Quantities and Form of Tender may be obtained from the latter on payment of Two Guineas, to be returned if a *bonâ-fide* tender is sent in.

Sealed tenders, endorsed "Retort-Benches, Contract No. 2," to be addressed to the Chairman, Gas Committee, Mossley, and sent so as to reach me not later than Noon on Thursday, the 31st of October, 1895.

The Committee do not bind themselves to accept the lowest or any tender.

JOSEPH HYDE,
Town Clerk.

Town Hall, Mossley,
Oct. 11, 1895.

TO ENGINEERS AND IRONFOUNDERS.

THE Mossley Gas Committee invite TENDERS for the supply and fixing of sundry CAST and WROUGHT IRON and STEEL MOUNTINGS of Retort-Benches, &c.

The Drawings and Specification may be seen on application to Mr. Merrell, Manager, Gas-Works, Mossley, and at the Office of Messrs. Thomas Newbigging and Son, 5, Norfolk Street, Manchester.

Quantities and Form of Tender may be obtained from the latter on payment of Two Guineas, which will be returned if a *bonâ-fide* tender is sent in.

Sealed tenders, endorsed "Retort-Bench Mountings, &c., Contract No. 3," to be addressed to the Chairman, Gas Committee, Mossley, and sent so as to reach me not later than Noon on Thursday, the 31st of October, 1895.

The Committee do not bind themselves to accept the lowest or any tender.

JOSEPH HYDE,
Town Clerk.

Town Hall, Mossley,
Oct. 12, 1895.

Price 15s., Limp Cloth, the Fifteenth Yearly

ANALYSIS OF THE ACCOUNTS
OF THE
Metropolitan Water Companies,

Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex—showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand Gallons of Water supplied; the proportion of Expenditure and Profits to Gross Income; and the Income, Expenditure, and Profits per House, &c., supplied for the Year ended December 31, 1894, or March 31, 1895, together with the quantity of Water supplied, the estimated daily quantity supplied for domestic and other purposes, the quantity supplied per head of population, &c., &c., for the Year ended December 31, 1894.

Compiled and arranged by
ALFRED LASS, F.C.A.

LONDON: Walter King, 11, Bolt Court, Fleet St., E.C.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:
90, CANNON STREET, E.C.

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD

MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL Co., Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

ALL COMMUNICATIONS RESPECTING THE

INCLINED RETORT SYSTEM

SHOULD BE ADDRESSED TO

THE AUTOMATIC COAL-GAS RETORT COMPANY, LTD.,

Palace Chambers, 9, Bridge St., Westminster, S.W.

NOTICE.

The Incandescent Gas-Light Company, Limited, Hereby Give Notice, that they only supply their Mantles subject to the following express Conditions, which are printed and pasted on each box:—

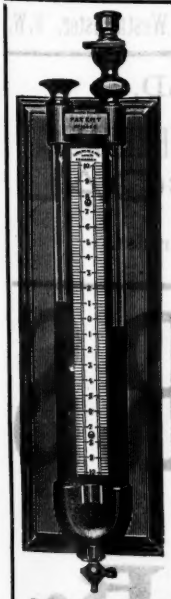
"The Incandescent Gas-Light Company Limited, in supplying the Mantle contained in this box, grant a Limited License to the purchaser to sell or use the same on the express condition that neither the purchaser nor any other person into whose hands the same may come shall use or sell the said Mantle except in connection, or for use, with Burners sold or supplied by the Company; any other sale or use will amount to Infringement of the Company's Patents. The Company supply Mantles for the purpose of renewals at the nominal price of 1s. 3d., subject to the Conditions and Limitations above set forth."

In the case of *The Incandescent Gas-Light Company, Limited v. Cantelo,* **Mr. Justice Wills upheld the Validity of these Conditions and Limited License; and, in the course of his Judgment, said:—**

The patentee has the sole right of using and selling the articles; and he may prevent anybody from dealing with them at all. Inasmuch as he has the right to prevent people from using them or dealing in them at all, he has the right to do the lesser thing—that is to say, to impose his own conditions. It does not matter how unreasonable or how absurd the conditions are. It does not matter what they are if he says at the time when the purchaser proposes to buy, or the person proposes to take a license: 'Mind I only give you this license on this condition;' and the purchaser is free to leave it or take it as he likes. If he takes it, he must be bound by the condition."

In the case of *The Incandescent Gas-Light Company v. Hirschfeld and Others,* **the Honourable Mr. Justice Romer certified that the Validity of the Plaintiffs' Patents was established. Infringers in future will be liable to costs as between Solicitor and Client.**

(Signed) **FAITHFULL & OWEN,**
Solicitors for the Incandescent Gas-Light Company, Limited.



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HEBBURN MAIN GAS COALS.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·4 candles.
Coke	68 per cent.

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HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS:—

Yield of Gas Per Ton	11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.	
Coke (of good & pure quality)	13¾ Cwt. Per Ton.
Sulphur	A little over 1 Per Cent.
Ash	Under 1 Per Cent.
Tar	163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor	103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

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PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton	10,500 Cubic Feet.
Illuminating Power	17 Stand. Sperm Candl.
Coke (of excellent quality)	13½ Cwt. Per Ton.
Sulphur	1·13 Per Cent.
Ash	1·34 Per Cent.
Tar	180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor	94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

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BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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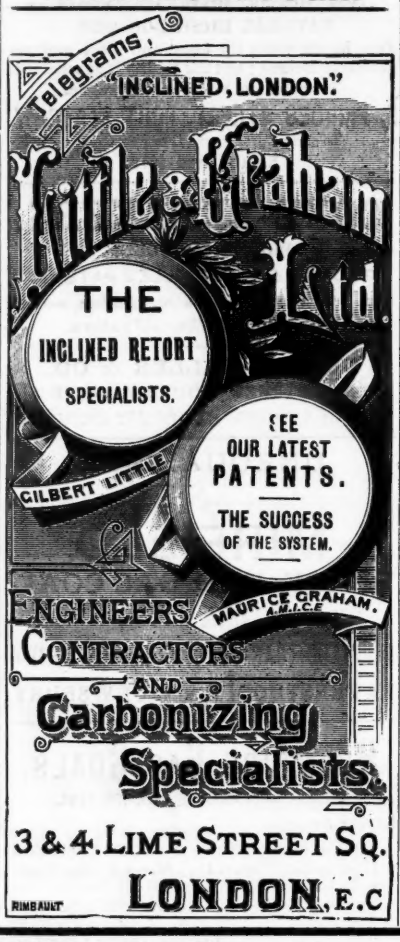

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RAISED AT

The Wharncliffe Woodmoor Colliery,

BARNSLEY.

Yield of Gas, nearly 12,000 *Cubic Feet per ton of Coal; and Illuminating Power nearly* 17½ *Candles.*

The following is a complete ANALYSIS made by Mr. R. O. PATERSON, C.E., Gas-Works, Cheltenham:—

Specific Gravity (Water 1)	1·276
Weight of One Cubic Foot	79·700 lbs.

PROXIMATE ANALYSIS.

Moisture in Coal	2·68 per cent.
Volatile Matter	35·60 ,,
Fixed Carbon	58·80 ,,
Sulphur	0·96 ,,
Ash	1·96 ,,

COMMERCIAL ANALYSIS.

Gas per Ton of Coal	11,760 cub. feet.
Gas per Cubic Foot of Coal	418 ,,
Illuminating Power	17·44 candles.
Value of One Cubic Foot in Sperm	418 grains.
Value per Ton of Coal in Sperm	703 lbs.
Coke per Ton of Coal	1367 ,,
Coke	61·05 per cent.
Ash in Coke	3·21 ,,
Sulphur Eliminated with Volatile Products per Ton of Coal	9·4 lbs.
Sulphur in Coke per Ton of Coal	12 ,,
Ammoniacal Liquor per Ton of Coal	19·7 galls.
Tar per Ton of Coal	12·2 ,,

R. O. PATERSON, C.E.

Gas-Works, Cheltenham, 8th August, 1894.

For Price, &c., apply to the

Wharncliffe Woodmoor Colliery Co LIMITED,

BARNSLEY;

Or to **Mr. W. H. HARVEY,**

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ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.

Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

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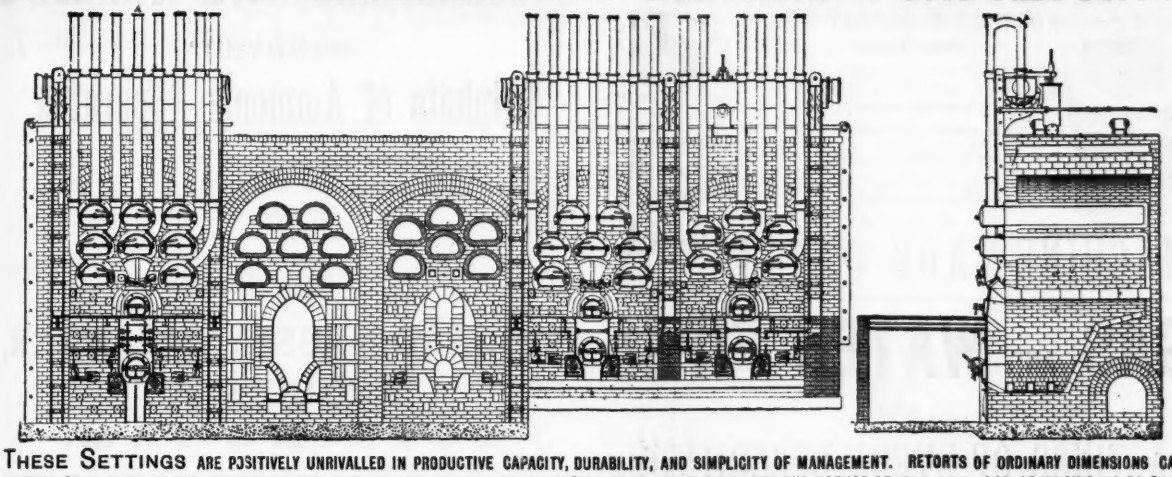
HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED OST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non* TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

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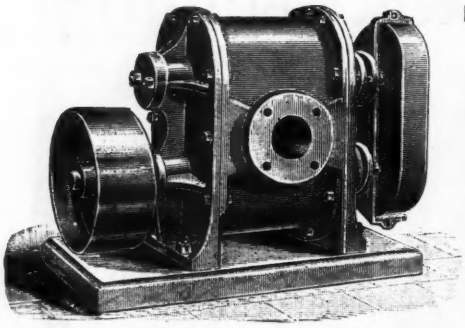

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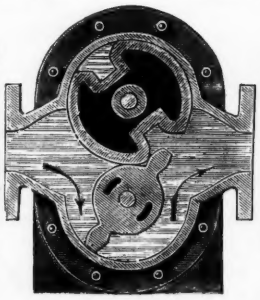

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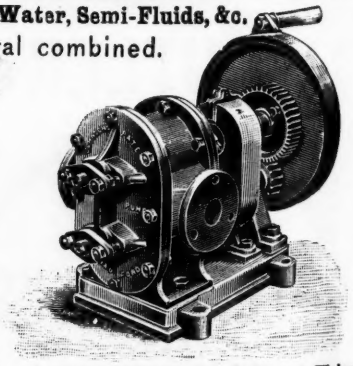

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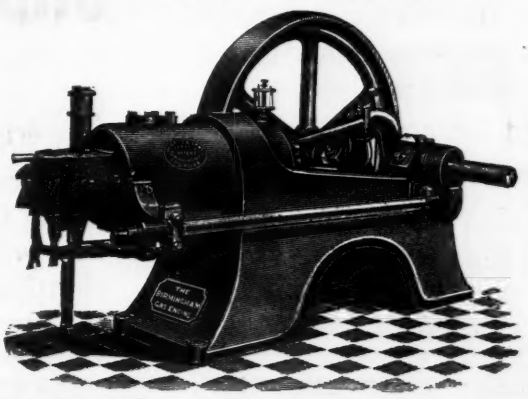
KING BROTHERS, STOURBRIDGE.
[See Illustrated Advertisement, Oct. 1, p. 697.]

THE BIRMINGHAM GAS-ENGINE
"OTTO" CYCLE.



A thoroughly reliable Engine for Commercial or Electric Lighting Purposes. Simple, Strong, Interchangeable.

GAS CONSUMPTION COMPARES FAVOURABLY WITH THE LATEST MODERN ENGINES.

GENERAL SIZES STOCKED.

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Engineers and Founders,
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ETNA WORKS,
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IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of
Gas Apparatus,
Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimates supplied.

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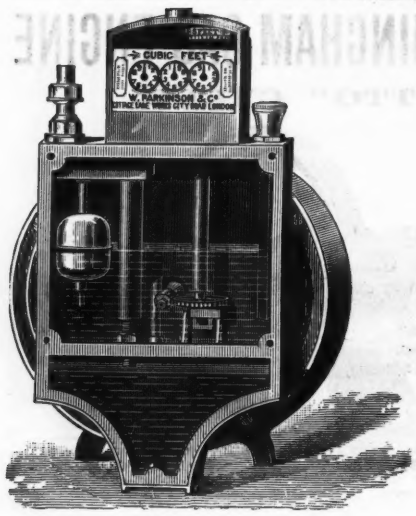
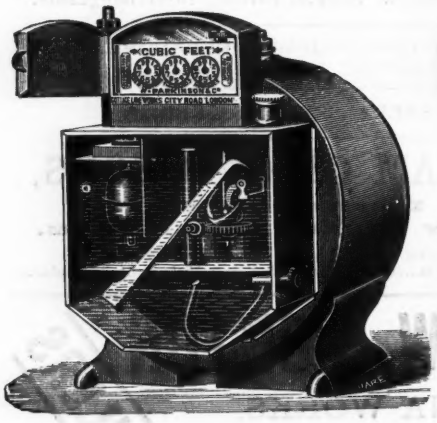
OLDEST ESTABLISHED FIRM IN THE TRADE.



ORDINARY WET METERS

IN CAST-IRON CASES.

Work with very little friction. Will stand very high pressures. Cannot possibly be shut off by sudden increase of pressure, the Float being affected by Outlet Gas only. Allow for loss of water by evaporation without materially affecting the registration or shutting off the gas. Unexcelled for simplicity of construction, excellence of workmanship, or accuracy in registration.



COMPENSATING METERS

IN TINNED OR CAST-IRON CASES.

The Slow-Spoon Compensator has been in extensive use for many years; it maintains an unvarying water-line without appreciable friction, and provides a large reserve of water. The Float arrangement allows sudden or excessive pressure on the Inlet without affecting the working of the Meter or extinguishing the Lights.

DRY METERS.

These Meters are unsurpassed for accuracy of registration. The cases are made of the best Charcoal Tin Plates; and each part of the Meter is stamped by special Machinery to ensure uniformity and exactness in construction. The Diaphragms are all of the best Persian Sheep Skins, carefully selected, and the brasswork and smaller fittings are of superior workmanship.

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS-METERS."

[See also Advt. p. 818.

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